The National Bureau of Standards

Functions and Activities

The functions of the National Bureau of Standards are set forth in the Act of Congress, March 3, 1901, as amended by Congress in Public Law 619, 1950. These include the development and maintenance of the national standards of measurement and the provision of means and methods for making measurements consistent with these standards; the determination of physical constants and properties of materials; the development of methods and instruments for testing materials, devices, and structures; advisory services to government agencies on scientific and technical problems; invention and development of devices to serve special needs of the Government; and the development of standard practices, codes, and specifications. The work includes basic and applied research, development, engineering, instrumentation, testing, evaluation, calibration services, and various consultation and information services. Research projects are also performed for other government agencies when the work relates to and supplements the basic program of the Bureau or when the Bureau's unique competence is required. The scope of activities is suggested by the listing of divisions and sections on the inside of the back cover.

Publications

The results of the Bureau's research are published either in the Bureau's own series of publications or in the journals of professional and scientific societies. The Bureau itself publishes three periodicals available from the Government Printing Office: The Journal of Research, published in four separate sections, presents complete scientific and technical papers; the Technical News Bulletin presents summary and preliminary reports on work in progress; and Basic Radio Propagation Predictions provides data for determining the best frequencies to use for radio communications throughout the world. There are also five series of nonperiodical publications: Monographs, Applied Mathematics Series, Handbooks, Miscellaneous Publications, and Technical Notes.

A complete listing of the Bureau's publications can be found in National Bureau of Standards Circular 460, Publications of the National Bureau of Standards, 1901 to June 1947 ($1.25), and the Supplement to National Bureau of Standards Circular 460, July 1947 to June 1957 ($1.50), and Miscellaneous Publication 240, July 1957 to June 1960 (Includes Titles of Papers Published in Outside Journals 1950 to 1959) ($2.25); available from the Superintendent of Documents, Government Printing Office, Washington 25, D.C.

UNITED STATES DEPARTMENT OF COMMERCE • Luther H. Hodges, *Secretary*

NATIONAL BUREAU OF STANDARDS • A. V. Astin, *Director*

Standard Materials

Issued by the National Bureau of Standards

A Descriptive List With Prices

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National Bureau of Standards Miscellaneous Publication 241

Issued March 12, 1962

(Supersedes NBS Circular 552, 3d Edition)

For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C.
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STANDARD MATERIALS

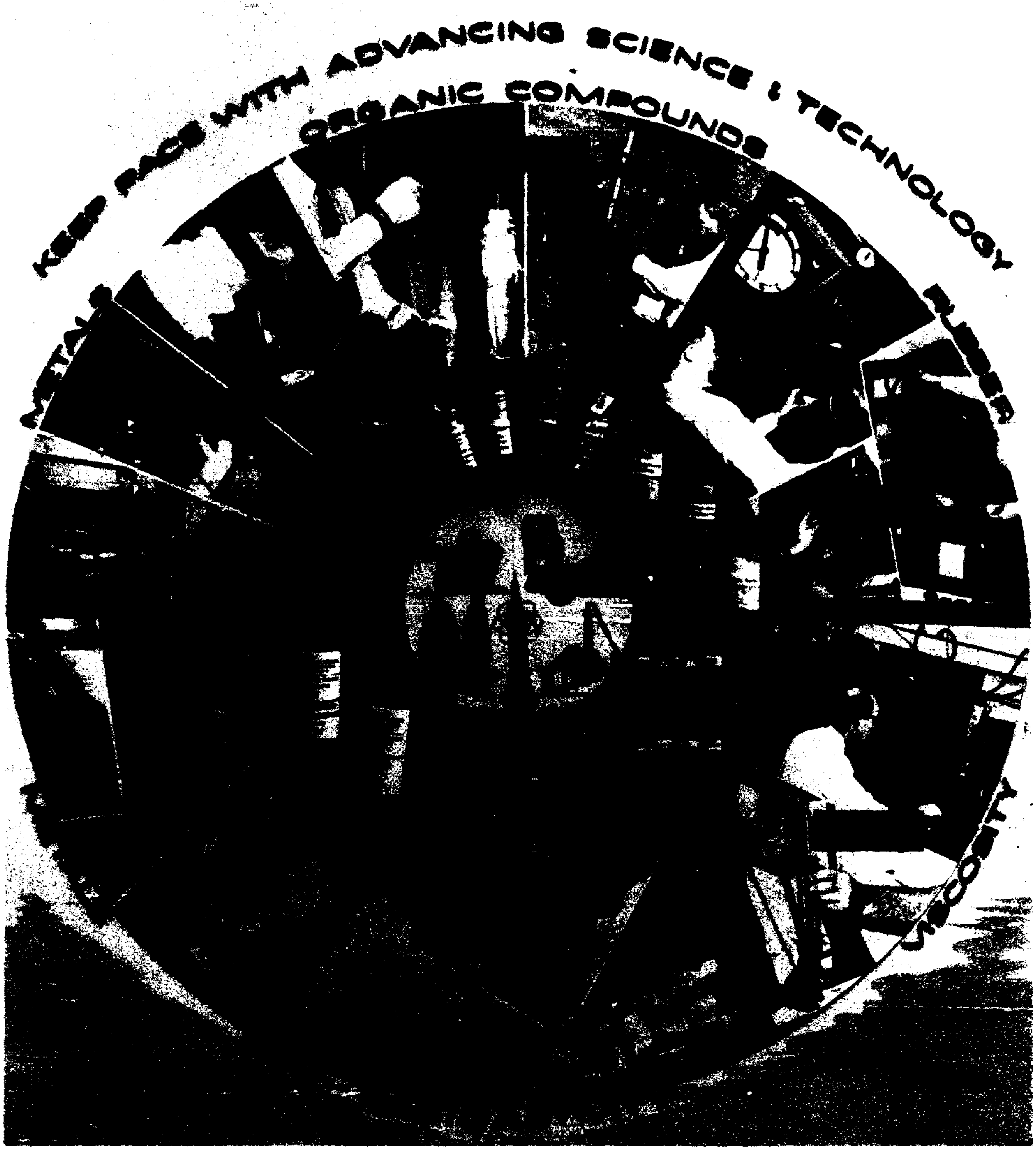

FIGURE 1. *Panel showing NBS Standard Materials. Over 600 different standards of metals, ores, ceramics, chemicals, and hydrocarbons are now available for distribution.*

CONTENTS

Standard Materials

Issued by the National Bureau of Standards

A descriptive listing of the various Standard Materials issued by the National Bureau of Standards is given. A schedule of fees and weights, as well as directions for ordering, is included. Summarized tables of analyses are presented, to indicate the type of standards of composition presently available. Announcements of new standards will be made in the Federal Register, in scientific and trade journals, and in the Standard Materials column of the National Bureau of Standards Technical News Bulletin. The current status of the various standards will be indicated by an *insert sheet* available from the Bureau

1. General Information

1.1. Introduction

This publication lists the standard materials issued by the National Bureau of Standards and provides information on their procurement. Each of these materials bears a distinguishing name and number, by which it is permanently identified, and each sample bearing a given designation is of identical composition or properties (within the limits required by the use for which the material is intended) with every other sample bearing the same designation.

The first standard materials issued by the Bureau were a small group of metals certified with respect to their chemical composition. Because of their use as standards in chemical analysis, the term *Standard Samples* was applied to them. This term was extended first to similar composition standards, and later to cover materials certified with respect to chemical purity or to some physical or chemical property. By usage the term has been extended also to certain materials that are issued without certification of composition or properties.

The primary purpose of the Standard Materials program is to help provide a central basis for uniformity and accuracy of measurement. Pursuant to this purpose, emphasis is given to providing NBS Standard Materials (a) where attainment of needed accuracy of analysis or accuracy of measurement of characteristics is not economically or technically feasible elsewhere, and where such accuracy is important to users widely, (b) where industry-wide standards for commerce are needed from a disinterested supplier who is not otherwise available, and (c) where continuing availability of material from a common source is important to science or industry.

In this publication the materials are classified into groups according to the purposes for which they are intended and the kind of certification, if any, that applies to them. More than 600 different standards of metals, ores, ceramics, chemicals, and hydrocarbons are now available for distribution. About 325 of these are certified for chemical composition. Some 150 of the composition standards have been prepared specifically for use in spectroscopic analysis. Other standard materials include those certified for such properties as acidity (pH), viscosity, freezing-point, density, index of refraction, and heat of combustion. Recent additions include new point-source radioactivity standards, hydrocarbon blends, metallo-organic materials soluble in lubricating oils, thermometric cells, magnesium-treated irons, zirconium-base alloy, high-temperature alloy, and new white-irons, copper-base, titanium-base, and high-temperature alloys for spectrographic use.

Some of the principal uses of NBS standard materials are: Checking methods of analysis and analytical techniques; standardizing solutions for volumetric analysis; developing new or improved methods of analysis; evaluating the accuracy of analytical methods; and calibrating and standardizing spectrometers, spectrographs, colorimeters, pH meters, Geiger counters, scintillaters, ionization chambers, pyrometers, polarimeters, refractometers, viscometers, and other laboratory and plant instruments.

Standard hydrocarbons, certified for degree of purity, serve to calibrate instruments used in controlling the production of plastics, synthetic rubber, and motor fuels.

Also listed in the publication are a number of standard materials for which it is not feasible to supply numerical values of composition or properties or for which such certification would not be useful. These materials nevertheless provide assurance of identity among all samples bearing a given designation and thus permit standardization of test procedures and referral of physical or chemical data on unknown materials to a common basis.

For information on certain physical standards, individually certified and intended primarily for the calibration of instruments, consult "Test Fee Schedules of the National Bureau of Standards".

1.2. Standards Out of Stock

The preparation of "renewal" standards is intended to be completed at the time each kind of standard becomes exhausted, but owing to delays encountered in obtaining a proper grade of material and for other reasons, this is not always possible. If orders are received for standards that are out of stock, notice will be mailed to that effect. The composition of a "renewal" of an analyzed standard will not usually be identical with that of its predecessor, but it will be quite similar, especially with regard to the characteristic constituent or constituents.

1.3. New Standards

When new standards or renewals of old ones are issued, announcement will be made in scientific and trade-journals, in the Standard Materials column of National Bureau of Standards Technical News Bulletin, and in the Federal Register.

2. Purchase Procedure

2.1. Identification of Standards

The standards are listed by groups; the numbers represent the issuance of the first representative sample of each kind. Renewals are indicated by the original number with an added letter to denote the relation. Thus, 11a is the first, 11b the second, 11c is the third renewal of No. 11 Basic Open-Hearth Steel, 0.2 percent carbon. In this way, a particular number always represents a material of fixed or approximately fixed composition.

2.2. Ordering

Orders should give the amount, number, and name of the standard desired. For example: 150 grams of No. 11g, Basic Open-Hearth Steel, 0.2% C. The list of standard materials, their numbers, prices, and composition or intended use are given on the pages which follow. Samples are distributed only in the units listed.

2.3. Terms and Shipping

2.3.1. Domestic Shipments

Shipments of material (other than hydrocarbons, organic sulfur compounds and radioactive standards) intended for the United States, Mexico, Canada, and Cuba are normally shipped prepaid parcel post (providing that the parcel does not exceed the weight limits as prescribed by Postal Laws and Regulations) unless the purchaser requests a different mode of shipment, in which case the shipment will be sent collect. It is impractical for the Bureau to prepay shipping charges and add this cost to the billing invoice. Hydrocarbons, organic sulfur compounds, rubber compounding materials, viscometer calibrating oils, and radioactive standards are shipped express collect. (See pp. 14, 15, and 16.) No discounts are given on NBS Standard Materials.

2.3.2. Foreign Shipments

Small shipments will be forwarded as a United States Government shipment via International Parcel Post, providing that the parcel does not exceed the weight limits as prescribed by Postal Laws and Regulations to foreign countries. Shipments exceeding the parcel post weight limit must be handled through an agent (shipping or brokerage firm) located in the United States as designated by the purchaser. Parcels will be packed for overseas shipment and forwarded via express collect to the United States firm designated as agent.

2.3.3. Payment for Foreign Orders

Remittances in payment of foreign orders must be made payable to the National Bureau of Standards, and are *required in advance*. These remittances must be drawn on a bank in the United States and payable at the standard rate of United States currency.

3. Descriptive List of Standard Materials With Weights and Fees

3.1. Standards of Certified Chemical Composition

[For detailed information on compositions and properties certified, see p. 3 to 5, as indicated in the table of contents, p. III. (*See mimeographed insert for standards out of stock, renewals, and new standards.*)]

3.1.1. Chemical Standards

Sample No.	Name	Approximate weight of sample in grams	Price per sample	Sample No.	Name	Approximate weight of sample in grams	Price per sample
			STEELS				
8i	Bessemer, 0.1 C	150	$6.00	33d	Ni-Mo (SAE 4820)	150	$6.00
10g	Bessemer, 0.2 C	150	6.00	72f	Cr-Mo (SAE X4130)	150	6.00
170a	B.O.H. 0.05 C, 0.2 Ti	150	6.00	111b	Ni-Mo (SAE 4620)	150	6.00
15f	B.O.H., 0.1 C	150	6.00	36a	Cr2-Mo1	150	6.00
11g	B.O.H., 0.2 C	150	6.00	106b	Cr-Mo-Al (Nitralloy G)	150	6.00
12g	B.O.H., 0.4 C	150	6.00	139a	Cr-Ni-Mo (AISI 8640)	150	6.00
152	B.O.H., 0.5 C, 0.04 Sn	150	6.00	156	Cr-Ni-Mo (NE 9450)	150	6.00
13f	B.O.H., 0.6 C	150	6.00	159	Cr1-Mo0.4-Ag0.1	150	6.00
14d	B.O.H., 0.8 C	150	6.00	50c	W18-Cr4-V1	150	7.50
16d	B.O.H., 1.0 C	150	6.00	132a	Mo5-W6-Cr4-V2	150	7.50
19f	A.O.H., 0.2 C	150	6.00	134a	Mo8-W2-Cr4-V1	150	7.50
20f	A.O.H., 0.4 C	150	6.00	153a	Mo9-W2-Cr4-V2-Co8	150	7.50
51b	Electric furnace, 1.2 C	150	6.00	155	Cr0.5-W0.5	150	7.50
65d	Basic electric, 0.3 C	150	6.00	73b	Stainless (Cr13) (SAE 420)	150	7.50
100b	Manganese (SAE T1340)	150	6.00	133a	Stainless (Cr13-Mo0.3-S0.3)	150	7.50
105	High-sulfur, 0.2 C (carbon only)	150	3.00	101e	Cr18-Ni9 (SAE 304)	150	7.50
125a	High-silicon, 3 Si	150	6.00	121c	Cr18-Ni10 (Ti-bearing) (SAE 321)	150	7.50
129b	High-sulfur (SAE X1112)	150	6.00				
130a	Lead-bearing, 0.2 Pb	150	6.00	123b	Cr-Ni-Nb 0.7-Ta 0.2 (SAE 347)	150	7.50
151	Boron-bearing, 0.003 B	150	3.00	160a	Cr19-Ni14-Mo3 (SAE 316)	150	7.50
30e	Cr-V (SAE 6150)	150	6.00	166b	Cr19-Ni9 (carbon only)	150	7.50
32e	Cr-Ni (SAE 3140)	150	6.00	126b	High-nickel (Ni36)	150	7.50
			IRONS				
3	White iron	125	$7.50	107b	Nickel-chromium-molybdenum cast iron	150	$7.50
4i	Cast iron	150	7.50				
5k	Cast iron	150	7.50	115a	Nickel-chromium-copper cast iron	150	7.50
6f	Cast iron	150	7.50				
7g	Cast iron	150	7.50	122d	Cast iron (car wheel)	150	7.50
55e	Ingot iron	150	7.50	341	Ductile iron	150	7.50
82a	Nickel-chromium cast iron	150	7.50	342	Nodular iron	150	7.50
			STEEL-MAKING ALLOYS				
57	Refined silicon	60	$6.00	71	Calcium molybdate	60	$6.00
61a	Ferrovanadium (high carbon)	100	6.00	90	Ferrophosphorus	75	6.00
64b	Ferrochromium (high carbon)	100	6.00	172	Ferroboron	100	6.00
66a	Spiegeleisen	100	6.00				
			NONFERROUS ALLOYS				
85b	Aluminum alloy, wrought	75	$6.00	158	Bronze, silicon	150	$10.00
86c	Aluminum-base casting alloy	75	6.00	167	Co43-Mo4-Nb3-W4	150	10.00
87a	Aluminum-silicon alloy	75	6.00	168	Co41-Mo4-Nb3-Ta1-W4	150	10.00
53d	Bearing metal, lead-base	170	10.00	349	Nickel-base (Ni57-Co14-Cr20)	150	10.00
54d	Bearing metal, tin-base	170	10.00	157a	Nickel silver (Cu58-Ni12-Zn29)	135	10.00
37e	Brass, sheet	150	10.00	161	Nickel-base casting alloy	150	10.00
52c	Bronze, cast	150	10.00	162a	Monel-type (Ni64-Cu31)	150	10.00
184	Bronze, leaded-tin	150	10.00	169	Ni77-Cr20 alloy	150	10.00
62d	Bronze, manganese	150	10.00	171	Magnesium-base alloy	100	6.00
164a	Bronze, aluminum	150	10.00	127a	Solder (Pb70-Sn30)	170	10.00
63c	Bronze, phosphorus	150	10.00	94b	Zinc-base die-casting alloy	150	6.00
124d	Bronze (Cu85-Pb5-Sn5-Zn5)	150	10.00				

3. Descriptive List of Standard Materials With Weights and Fees—Continued

3.1. Standards of Certified Chemical Composition—Continued

3.1.1. Chemical Standards—Continued

Sample No.	Name	Approximate weight of sample in grams	Price per sample	Sample No.	Name	Approximate weight of sample in grams	Price per sample
	TITANIUM- AND ZIRCONIUM-BASE ALLOYS						
173	Al6-V4	100	$10.00	360	Zircaloy	100	$20.00
174	Al4-Mn4	100	10.00				
	ORES						
69a	Bauxite	50	$6.00	25c	Manganese ore	100	$6.00
27d	Iron ore, Mesabi	110	6.00	120a	Phosphate rock	45	6.00
28a	Iron ore, Norrie	50	3.00	137	Tin Ore (Bolivian concentrate)	50	6.00
181	Lithium Ore (Spodumene)	45	6.00	138	Tin Ore (N.E.I. concentrate)	50	6.00
182	Lithium Ore (Petalite)	45	6.00	113	Zinc Ore (Tri-State concentrate)	50	6.00
183	Lithium Ore (Lepidolite)	45	6.00				
	CERAMIC MATERIALS						
76	Burned refractory (40% Al_2O_3)	60	$6.00	91	Glass, opal	45	$6.00
77	Burned refractory (60% Al_2O_3)	60	6.00	92	Glass, low boron	45	6.00
78	Burned refractory (70% Al_2O_3)	60	6.00	93	Glass, high boron	45	6.00
103a	Chrome refractory	60	6.00	165	Glass sand (low iron)	60	6.00
198	Silica refractory (0.2% Al_2O_3)	45	6.00	1a	Limestone, argillaceous	50	6.00
199	Silica refractory (0.5% Al_2O_3)	45	6.00	102	Silica brick	60	6.00
177	Cement, portland	15	6.00	104	Burned magnesite	60	6.00
99	Feldspar, soda	40	6.00	112	Silicon carbide	85	6.00
89	Glass, lead-barium	45	6.00	154a	Titanium dioxide	40	6.00

Sample No.	Item	Unit of issue	Price per sample
	HYDROCARBON BLENDS [a]		
592	Blend no. 1. C_7 Paraffins in Typical Virgin Naphthas	10 ampoules	$12.00
593	Blend no. 2. C_7 Paraffins in Typical Catalytically Cracked Naphthas	10 ampoules	12.00
594	Blend no. 3. C_8 Paraffins in Typical Virgin Naphthas	10 ampoules	12.00
595	Blend no. 4. C_8 Paraffins in Catalytically Cracked Naphthas	10 ampoules	12.00
596	Blend no. 5. C_7 Cycloparaffins in Typical Virgin Naphthas	10 ampoules	12.00
597	Blend no. 6. C_7 Cycloparaffins in Catalytically Cracked Naphthas	10 ampoules	12.00
598	Blend no. 7. C_8 Cycloparaffins in Typical Virgin Naphthas	10 ampoules	12.00
599	Blend no. 8. C_8 Cycloparaffins in Catalytically Cracked Naphthas	10 ampoules	12.00

[a] These standard hydrocarbon blends were prepared for calibration of mass spectrometric and other instrumental procedures used in analysis of gasolines, naphthas and blending stocks. Each sample comprises ten ampoules, each ampoule containing about 0.03 ml of the blend. To retard the effects of possible fractionation of the components after the ampoule is opened, each ampoule is intended to provide material for only one calibration analysis.

Sample No.	Type	O	N	Size of sample	Price per sample
	CARBON STEELS AND IRON (CERTIFIED FOR OXYGEN AND NITROGEN ONLY) [a]				
1040	Low-carbon, rimming	0.018	0.003	3 in. by 1 in.	$10.00
1041	Medium-carbon	.017	.004	3 in. by 1 in.	10.00
1042	Bessemer, rimming	.017	.014	3 in. by 1 in.	10.00
1044	Low-carbon, Si-killed	.009	.004	3 in. by 1 in.	10.00
1045	Medium-carbon, Si-killed	.007	.004	3 in. by 1 in.	10.00
1047	Low-carbon	.017	.004	3 in. by 1 in.	10.00

[a] These materials are not certified for use as spectroscopic standards.

3.1. Standards of Certified Chemical Composition—Continued

3.1.1. Chemical Standards—Continued

Sample No.	Composition percent hydrogen	Approximate weight of sample in grams	Price per sample
UNALLOYED TITANIUM FOR HYDROGEN			
352	0.003	20	$10.00
353	.01	20	10.00
354	.02	20	10.00

URANIUM ISOTOPIC STANDARDS

Fifteen uranium isotopic standards are now available from NBS. They represent the following weight percent U^{235}: 0.5, 1, 1.5, 2, 3, 5, 10, 15, 20, 35, 75, 80, 85, 90, and 93. Each isotopic standard issue unit contains a quantity of uranium oxide (U_3O_8) equivalent to 1 g of uranium. Charges vary from $20.50 to $37.50 per unit, depending on the enrichment level. These standards are available only to the U.S. Atomic Energy Commission's contractors and licensees. Order forms and further information may be obtained from the National Bureau of Standards, Washington 25, D.C.

3.1.2. Spectroscopic Standards

Sample Nos.[a]		Name	Price per sample[b]	Sample Nos.[a]		Name	Price per sample[b]
INGOT IRON AND LOW-ALLOY STEELS							
402	802	B.O.H., 0.8C	$6.00	414	(c)	Cr-Mo (SAE 4140)	$6.00
(c)	803a	A.O.H., 0.6C	6.00	415a	(c)	Bessemer, 0.5C	6.00
404a	804a	Basic electric	6.00	416a	(c)	Nitralloy G	6.00
405a	805a	Medium manganese	6.00	417	(c)	A.O.H., 0.4C	6.00
407a	807a	Chromium-vanadium	6.00	417a	817a	B.O.H., 0.4C	6.00
408a	808a	Chromium-nickel	6.00	418	(c)	Cr-Mo (SAE X4130)	6.00
409b	809b	Nickel	6.00	418a	818a	Cr-Mo (SAE X4130)	6.00
410a	810a	Cr2-Mo1	6.00	420a	820a	Ingot iron	6.00
(c)	811a	Cr-Mo (SAE X4130)	6.00	421	821	Cr-W, 0.9C	6.00
(c)	812a	Cr-Ni-Mo (NE 8637)	6.00	427	827	Cr-Mo (SAE 4150) (boron only)	6.00
413	(c)	A.O.H., 0.4C	6.00				

[a] Sizes: 400 series, rods 7/32 in. in diameter, 4 in. long (20 g); 800 series, rods 1/2 in. in diameter, 2 in. long (50 g).
[b] For each sample in the 400 and 800 series.
[c] This standard is available in only one size.

Sample Nos.[a]		Name	Price per sample	
			400 series	1100 series
SPECIAL INGOT IRONS AND LOW-ALLOY STEELS[b]				
461	[c] 1161	Low-alloy steel A (modified TS46B12)	$10.00	$20.00
462	1162	Low-alloy steel B (modified TS86B45)	10.00	20.00
463	1163	Low-alloy steel C (modified TS94B17)	10.00	20.00
464	1164	Low-alloy steel D (modified 14B52)	10.00	20.00
465	1165	Ingot iron E	10.00	20.00
466	1166	Ingot iron F	10.00	20.00
467	1167	Low-alloy steel G (modified C1010)	10.00	20.00
468	1168	Low-alloy steel H (modified TS4720)	10.00	20.00

[a] Sizes: 400 series, rods 7/32 in. in diameter, 4 in. long (20 g); 1100 series, disks 1 1/4 in. in diameter, 3/4 in. thick (120 g).
[b] The series of 8 standards provides a graded composition for the minor constituents.
[c] This size is suitable for X-ray analysis.

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3. Descriptive List of Standard Materials With Weights and Fees—Continued

3.1. Standards of Certified Chemical Composition—Continued

3.1.2. Spectroscopic Standards—Continued

Sample Nos.[a]		Name	Price per sample[b]	Sample Nos.[a]		Name	Price per sample[b]
STAINLESS STEELS							
		Group I				Group II	
442	([c])	Cr16-Ni10	$10.00	445	845	Cr13-Mo0.9 (Modified AISI 410)	$10.00
443	([c])	Cr18.5-Ni9.5	10.00	446	846	Cr18-Ni9 (Modified AISI 321)	10.00
444	([c])	Cr20.5-Ni10	10.00	447	847	Cr24-Ni13 (Modified AISI 309)	10.00
				448	848	Cr9-Mo0.3 (Modified AISI 403)	10.00
				449	849	Cr5.5-Ni6.5	10.00
				450	850	Cr3-Ni25	10.00
TOOL STEELS							
436	836	Special (Cr6-Mo3-W10)	$10.00	439	839	Mo High Speed (AISI-SAE M36)	$10.00
437	837	Special (Cr8-Mo2-W3-Co3)	10.00	440	840	Special W High Speed (Cr2-W13-Co12)	10.00
438	838	Mo High Speed (AISI-SAE M30)	10.00	441	841	W High Speed (AISI-SAE T1)	10.00

[a] Sizes: 400 series, rods 7/32 in. in diameter, 4 in. long (20 g); 800 series, rods ½ in. in diameter, 2 in. long (50 g).
[b] For each sample in the 400 and 800 series.
[c] This standard is available in only one size.

Sample Nos.	Name	Price per sample	Sample Nos.	Name	Price per sample
STAINLESS STEELS[b]			TOOL STEELS[b]		
D845[a]	Cr13-Mo0.9 (Modified AISI 410)	$15.00	D836[a]	Special (Cr6-Mo3-W10)	$15.00
D846	Cr18-Ni9 (Modified AISI 321)	15.00	D837	Special (Cr8-Mo2-W3-Co3)	15.00
D847	Cr24-Ni13 (Modified AISI 309)	15.00	D838	Mo High Speed (AISI-SAE M30)	15.00
D848	Cr9-Mo0.3 (Modified AISI 403)	15.00	D839	Mo High Speed (AISI-SAE M36)	15.00
D849	Cr5.5-Ni6.5	15.00	D840	Special W High Speed (Cr2-W13-Co12).	15.00
D850	Cr3-Ni25	15.00	D841	W High Speed (AISI-SAE T1)	15.00

[a] Size: Disks 1¼ in. in diameter, ¼ in. thick (45g).
[b] The disk samples are for use only in X-ray analysis and were prepared from the rods ½ in. in diameter by upset forging.

Sample Nos.	Name	Price per sample	Sample Nos.	Name	Price per sample
WHITE-CAST IRONS					
1176[a]	White-cast Iron A, Piston Ring	$25.00	1180	White-cast Iron E, Mold	$25.00
1177	White-cast Iron B, Wear Plate	25.00	1181	White-cast Iron F	25.00
1178	White-cast Iron C, Die	25.00	1182	White-cast Iron G	25.00
1179	White-cast Iron D, Brake Drum	25.00	1183	White-cast Iron H	25.00

[a] Size: Solid sections, approximately 1¼ in. square and ¾ in. thick (100 g). Suitable for optical emission and X-ray analysis.

Sample Nos.	Name	Price per sample	Sample Nos.	Name	Price per sample
COPPER-BASE ALLOYS					
1106[a]	Naval Brass A, Wrought	$25.00	C1107	Naval Brass B, Chill-Cast	$25.00
C1106	Naval Brass A, Chill-Cast	25.00	1108	Naval Brass C, Wrought	25.00
1107	Naval Brass B, Wrought	25.00	C1108	Naval Brass C, Chill-Cast	25.00

[a] Sizes: The sample numbers not preceded by a letter "C" are wrought and are disks 1¼ in. in diameter, ¾ in. thick (125g); the sample numbers preceded by the letter "C" have the same composition as the wrought form but are in the form of chill-cast sections 1¼ in. square, ¾ in. thick (160g).

3. Descriptive List of Standard Materials With Weights and Fees—Continued

3.1. Standards of Certified Chemical Composition—Continued

3.1.2. Spectroscopic Standards—Continued

TIN METAL

Sample Nos.	Name	Price per sample	Sample Nos.	Name	Price per sample
431 [a]	Tin A	$8.00	831 [a]	Tin A	$14.00
432	Tin B	8.00	832	Tin B	14.00
433	Tin C	8.00	833	Tin C	14.00
434	Tin D	8.00	834	Tin D	14.00
435	Tin E	8.00	835	Tin E	14.00

[a] Sizes: 400 series, rods ¼ in. in diameter, 4 in. long (25g); 800 series, rods, ½ in. in diameter, 2 in. long (45g).

ZINC-BASE, DIE-CASTING ALLOYS AND ZINC SPELTER

Sample Nos.	Name	Price per sample	Sample Nos.	Name	Price per sample
625 [a]	Zinc-base A [b]	$15.00	628	Zinc-base D	$15.00
626	Zinc-base B	15.00	629	Zinc-base E	15.00
627	Zinc-base C	15.00	630	Zinc-base F	15.00
			631	Zinc spelter (modified) [c]	15.00

[a] Size: Bar segments, 1¾ in. square and ¾ in. thick (250g).
[b] NBS Nos. 625, 626, and 627 correspond to ASTM Alloy AG40A; NBS Nos. 628, 629, and 630 correspond to ASTM Alloy AC41A.
[c] Modified by addition of 0.5 percent Al.

NICKEL OXIDES

Sample Nos.	Name	Price per sample	Sample Nos.	Name	Price per sample
671 [a]	Nickel oxide 1	$8.00	673	Nickel oxide 3	$8.00
672	Nickel oxide 2	8.00			

[a] Each sample consists of 25 g of powder.

HIGH-TEMPERATURE ALLOYS

Sample Nos.	Name	Price per sample	Sample Nos.	Name	Price per sample
1184 [a]	19–9DL	$25.00	1188	Inconel "X" 550	$25.00
1185	AMS 5360A, AISI 316	25.00	1189	Nimonic 80a	25.00
1186	16–25–6 (Cr-Ni-Mo)	25.00	1191	Waspaloy	25.00
1187	AMS 5376A, Multimet (N–155)	25.00	1192	Waspaloy Modified	25.00

[a] Size: Disks 1¼ in. in diameter, ¾ in. thick (120 g). Suitable for optical emission and X-ray analysis.

TITANIUM-BASE ALLOYS

Sample Nos.	Name	Price per sample	Sample Nos.	Name	Price per sample
641 [a]	8Mn (A)	$20.00	646	2Cr-2Fe-2Mo (C)	$20.00
642	8Mn (B)	20.00	653	6Al-4V (A)	20.00
643	8Mn (C)	20.00	654	6Al-4V (B)	20.00
644	2Cr-2Fe-2Mo (A)	20.00	655	6Al-4V (C)	20.00
645	2Cr-2Fe-2Mo (B)	20.00			

[a] Size: Disks 1¼ in. in diameter, ¾ in. thick (65g).

3. Descriptive List of Standard Materials With Weights and Fees—Continued

3.1 Standards of Certified Chemical Composition—Continued

3.1.2. Spectroscopic Standards—Continued

Sample No.	Name	Constituents determined	Approximate weight of sample in grams	Price per sample
	METALLO-ORGANIC STANDARDS [a]			
1050	Aluminum Cyclohexanebutyrate	Al 6.9	5	$10.00
1051	Barium Cyclohexanebutyrate	Ba 28.1	5	10.00
1052A	Bis(1-phenyl-1,3-butanediono) oxovanadium(IV).	V 13.1	5	10.00
1053	Cadmium Cyclohexanebutyrate	Cd 23.9	5	10.00
1055	Cobalt Cyclohexanebutyrate	Co 17.1	5	10.00
1056	Cupric Cyclohexanebutyrate	Cu 16.0	5	10.00
1057	Dibutyltin Bis(2-ethylhexanoate)	Sn 23.6	5	10.00
1058	Ferric Cyclohexanebutyrate	Fe 19.3	5	10.00
1059	Lead Cyclohexanebutyrate	Pb 37.5	5	10.00
1060	Lithium Cyclohexanebutyrate	Li 4.0	5	10.00
1061	Magnesium Cyclohexanebutyrate	Mg 6.9	5	10.00
1062	Manganous Cyclohexanebutyrate	Mn 13.9	5	10.00
1063	Menthyl Borate	B 2.27	5	10.00
1064	Mercuric Cyclohexanebutyrate	Hg 36.2	5	10.00
1065	Nickel Cyclohexanebutyrate	Ni 17.6	5	10.00
1066	Octaphenylcyclotetrasiloxane	Si 14.1	5	10.00
1067	Potassium Cyclohexanebutyrate	K 19.0	5	10.00
1068	Silver Cyclohexanebutyrate	Ag 38.7	5	10.00
1069	Sodium Cyclohexanebutyrate	Na 12.0	5	10.00
1070	Strontium Cyclohexanebutyrate	Sr 19.8	5	10.00
1071	Triphenyl Phosphate	P 9.5	5	10.00
1072	Tris(2′-hydroxyacetophenono) chromium (III).	Cr 10.6	5	10.00
1073	Zinc Cyclohexanebutyrate	Zn 18.5	5	10.00
1074	Calcium 2-Ethylhexanoate	Ca 13.4	5	10.00

[a] This group of metallo-organic standards is intended for use in preparing lubricating-oil solutions containing known amounts of the element, especially for spectroscopic use.

3.2. Standards of Certified Properties or Purity

3.2.1. Microchemical Standards

Sample No.	Name	Constituents determined or intended use	Approximate weight of sample in grams	Price per sample
140b	Benzoic acid	C, H	2	$6.00
141a	Acetanilide	N, C, H	2	6.00
142	Anisic acid	Methoxyl	2	6.00
143b	Cystine	S, C, H, N	2	6.00
145	2-Iodobenzoic acid	I	2	6.00
147	Triphenyl phosphate	P	2	6.00

3.2.2. Chemicals

84f	Acid potassium phthalate	Acidimetric value	60	$4.00
39h	Benzoic acid	Calorimetric value	30	4.00
350	Benzoic acid	Acidimetric value	30	4.00
40g	Sodium oxalate	Oxidimetric value	60	4.00
83b	Arsenic trioxide	Oxidimetric value	75	4.00
136b	Potassium dichromate	Oxidimetric value	75	4.00
17	Sucrose (cane-sugar)	Saccharimetric value	60	4.00
41	Dextrose (glucose)	Reducing value	70	4.00
950a	Uranium oxide (U_3O_8)	Uranium standard	25	5.00

3.2. Standards of Certified Properties or Purity—Continued

3.2.3. *p*H Standards

Sample No.	Name	Constituents determined or intended use	Approximate weight of sample in grams	Price per sample
185c	Acid potassium phthalate	*p*H (approx.) 4.0	60	$2.50
186Ib	Potassium dihydrogen phosphate	*p*H (approx.) 6.8 [a]	[b] 60	5.00
186IIb	Disodium hydrogen phosphate			
187a	Borax	*p*H (approx.) 9.2	30	2.50
188	Potassium hydrogen tartrate	*p*H (approx.) 3.6	60	2.50
189	Potassium tetroxalate	*p*H (approx.) 1.7	65	2.50

[a] 2 phosphates are to be used together in equal molar proportions.
[b] 30 g of each phosphate are furnished.

3.2.4. Freezing-Point Standards

Sample No.	Name	Constituents determined or intended use	Approximate weight of sample in grams	Price per sample
44e	Aluminum	660.0 °C	200	$6.00
45d	Copper	1083.3 °C	450	6.00
49e	Lead	327.417 °C	600	6.00
42f	Tin	231.88 °C	350	6.00
43g	Zinc	419.50 °C	350	6.00

3.2.5. Thermometric Cells

These cells are primarily intended for calibration of solidification point thermometers used in certain ASTM test procedures. The reference temperatures are realized under conditions of slow freezing of the liquid. Directions for their use are provided with each cell, together with a report of the maximum measured reference temperatures.

Sample No.	Item	Price
Standard 940	Phenol Thermometric Cell near 40.8 °C	$50.00
Standard 941	Naphthalene Thermometric Cell near 80.2 °C	50.00
Standard 942	Phthalic Anhydride Thermometric Cell near 131.1 °C	50.00

3. Descriptive List of Standard Materials With Weights and Fees—Continued

3.2. Standards of Certified Properties or Purity—Continued

3.2.6. Hydrocarbons and Organic Sulfur Compounds

Sample No.[a]	Compound		Amount of impurity[b]	Volume per sample[c]	Price per sample
	Formula	Name			
		PARAFFINS			
			Mole percent	*ml*	
201a-5	C_5H_{12}	*n*-Pentane	0. 15±0. 07	5	$10
201a-8S	C_5H_{12}	*n*-Pentane	. 15±0. 07	8	18
201a-25	C_5H_{12}	*n*-Pentane	. 15±0. 07	25	35
202a-8S	C_5H_{12}	2-Methylbutane (isopentane)	. 09±0. 06	8	18
299a-5S	C_5H_{12}	2,2-Dimethylpropane (neopentane)	. 022±0. 012	5	25
203b-5	C_6H_{14}	*n*-Hexane	. 020±0. 010	5	10
203a-8S	C_6H_{14}	*n*-Hexane	. 10±0. 05	8	18
203b-25	C_6H_{14}	*n*-Hexane	. 020±0. 010	25	35
204a-8S	C_6H_{14}	2-Methylpentane	. 16±0. 08	8	18
205a-8S	C_6H_{14}	3-Methylpentane	[d]. 20±0. 15	8	18
206a-8S	C_6H_{14}	2,2-Dimethylbutane	. 10±0. 04	8	18
207a-8S	C_6H_{14}	2,3-Dimethylbutane	. 11±0. 06	8	18
216a-5	C_7H_{16}	*n*-Heptane	. 01±0. 01	5	10
216a-8S	C_7H_{16}	*n*-Heptane	. 01±0. 01	8	18
216a-25	C_7H_{16}	*n*-Heptane	. 01±0. 01	25	35
224-5S	C_7H_{16}	3-Methylhexane	[d]. 25±0. 15	5	18
225-5S	C_7H_{16}	3-Ethylpentane	. 13±0. 03	5	18
227-5S	C_7H_{16}	2,3-Dimethylpentane	[d]. 25±0. 15	5	18
228-5S	C_7H_{16}	2,4-Dimethylpentane	. 17±0. 05	5	18
222-5S	C_7H_{16}	2,2,3-Trimethylbutane	. 06±0. 03	5	18
230-5S	C_8H_{18}	*n*-Octane	. 06±0. 04	5	25
231-5S	C_8H_{18}	2-Methylheptane	. 41±0. 18	5	25
232-5S	C_8H_{18}	3-Methylheptane	. 50±0. 23	5	25
233-5S	C_8H_{18}	4-Methylheptane	. 12±0. 07	5	25
234-5S	C_8H_{18}	3-Ethylhexane	[d]. 30±0. 20	5	25
235-5S	C_8H_{18}	2,2-Dimethylhexane	. 29±0. 11	5	25
236-5S	C_8H_{18}	2,3-Dimethylhexane	[d]. 30±0. 20	5	25
237-5S	C_8H_{18}	2,4-Dimethylhexane	[d]. 30±0. 20	5	25
238-5S	C_8H_{18}	2,5-Dimethylhexane	. 30±0. 09	5	25
239-5S	C_8H_{18}	3,3-Dimethylhexane	[d]. 30±0. 20	5	25
240-5S	C_8H_{18}	3,4-Dimethylhexane	[d]. 30±0. 20	5	25
241-5S	C_8H_{18}	2-Methyl-3-ethylpentane	. 23±0. 11	5	25
242-5S	C_8H_{18}	3-Methyl-3-ethylpentane	. 08±0. 04	5	25
243-5S	C_8H_{18}	2,2,3-Trimethylpentane	. 42±0. 20	5	25
217b-5	C_8H_{18}	2,2,4-Trimethylpentane [e, f]	. 007±0. 003	5	10
217b-8S	C_8H_{18}	2,2,4-Trimethylpentane [e, f]	. 007±0. 003	8	18
217b-25	C_8H_{18}	2,2,4-Trimethylpentane [e, f]	. 007±0. 003	25	35
217b-50	C_8H_{18}	2,2,4-Trimethylpentane [e, f]	. 007±0. 003	50	60
244-5S	C_8H_{18}	2,3,3-Trimethylpentane	. 40±0. 08	5	25
245-5S	C_8H_{18}	2,3,4-Trimethylpentane	. 19±0. 06	5	25
252-5S	C_9H_{20}	*n*-Nonane	. 08±0. 06	5	35
541-5S	C_9H_{20}	2,2,3-Trimethylhexane	[d]. 30±0. 20	5	35
253-5S	C_9H_{20}	2,2,4-Trimethylhexane	. 30±0. 20	5	35
254-5S	C_9H_{20}	2,2,5-Trimethylhexane	. 20±0. 04	5	35
542-5S	C_9H_{20}	2,3,3-Trimethylhexane	. 13±0. 06	5	35
255-5S	C_9H_{20}	2,3,5-Trimethylhexane	[d]. 30±0. 20	5	35
256-5S	C_9H_{20}	2,4,4-Trimethylhexane	. 29±0. 11	5	35
544-5S	C_9H_{20}	3,3,4-Trimethylhexane	. 23±0. 10	5	35
289-5S	C_9H_{20}	3,3-Diethylpentane	. 018±0. 011	5	35
296-5S	C_9H_{20}	2,2,3,3-Tetramethylpentane	. 064±0. 020	5	35
297-5S	C_9H_{20}	2,2,3,4-Tetramethylpentane	. 035±0. 014	5	35
257-5S	C_9H_{20}	2,2,4,4-Tetramethylpentane	. 16±0. 08	5	35
298-5S	C_9H_{20}	2,3,3,4-Tetramethylpentane	. 051±0. 037	5	35
505-5S	$C_{10}H_{22}$	*n*-Decane	. 04±0. 02	5	35
562-5S	$C_{11}H_{24}$	*n*-Undecane	. 04±0. 03	5	35
554-5S	$C_{12}H_{26}$	2,2,4,6,6-Pentamethylheptane	. 06±0. 04	5	35
573-5S	$C_{13}H_{28}$	*n*-Tridecane	. 09±0. 06	5	35
580-5S	$C_{14}H_{30}$	*n*-Tetradecane	. 07±0. 06	5	35
581-5S	$C_{15}H_{32}$	*n*-Pentadecane	. 07±0. 05	5	35
568-5S	$C_{16}H_{34}$	*n*-Hexadecane	. 06±0. 04	5	35

See footnotes at end of tables.

3. Descriptive List of Standard Materials With Weights and Fees—Continued

3.2. Standards of Certified Properties or Purity—Continued

3.2.6. Hydrocarbons and Organic Sulfur Compounds—Continued

Sample No.[a]	Compound		Amount of impurity[b]	Volume per sample[c]	Price per sample
	Formula	Name			
		ALKYL CYCLOPENTANES			
			Mole percent	*ml*	
219-5S	C_5H_{10}	Cyclopentane	0.05±0.02	5	$18
208a-5	C_6H_{12}	Methylcyclopentane	.11±0.06	5	10
208a-8S	C_6H_{12}	Methylcyclopentane	.11±0.06	8	18
208a-25	C_6H_{12}	Methylcyclopentane	.11±0.06	25	[illegible]
266-5S	C_7H_{14}	Ethylcyclopentane	.06±0.03	5	
267-5S	C_7H_{14}	1,1-Dimethylcyclopentane	.03±0.02	5	
269-5S	C_7H_{14}	1,*trans*-2-Dimethylcyclopentane	.19±0.10	5	
271-5S	C_7H_{14}	1,*trans*-3-Dimethylcyclopentane	.39±0.09	5	
272-5S	C_8H_{16}	*n*-Propylcyclopentane	.20±0.10	5	25
273-5S	C_8H_{16}	Isopropylcyclopentane	.20±0.07	5	25
274-5S	C_8H_{16}	1-Methyl-1-ethylcyclopentane	.13±0.08	5	50
275-5S	C_8H_{16}	1-Methyl-*cis*-2-ethylcyclopentane	.48±0.24	5	50
279-5S	C_8H_{16}	1,1,2-Trimethylcyclopentane	.015±0.009	5	50
280-5S	C_8H_{16}	1,1,3-Trimethylcyclopentane	.48±0.32	5	50
290-5S	C_8H_{16}	1,*cis*-2,*cis*-3-Trimethylcyclopentane	.10±0.06	5	50
294-5S	C_8H_{16}	1,*cis*-2,*trans*-4-Trimethylcyclopentane	.42±0.23	5	50
295-5S	C_8H_{16}	1,*trans*-2,*cis*-4-Trimethylcyclopentane	.24±0.10	5	50
517-5S	C_9H_{18}	*n*-Butylcyclopentane	.034±0.025	5	35
518-5S	C_9H_{18}	Isobutylcyclopentane	.16±0.08	5	35
583-5S	$C_{10}H_{18}$	Cyclopentylcyclopentane	.05±0.03	5	35
588-5S	$C_{15}H_{30}$	*n*-Decylcyclopentane	.20±0.18	5	35
		ALKYL CYCLOHEXANES			
			Mole percent	*ml*	
209a-5	C_6H_{12}	Cyclohexane	0.010±0.006	5	$10
209a-8S	C_6H_{12}	Cyclohexane	.010±0.006	8	18
209a-25	C_6H_{12}	Cyclohexane	.010±0.006	25	35
218a-8S	C_7H_{14}	Methylcyclohexane[e]	.03±0.02	8	18
218a-25	C_7H_{14}	Methylcyclohexane[e]	.03±0.02	25	35
258-5S	C_8H_{16}	Ethylcyclohexane	.13±0.08	5	25
259-5S	C_8H_{16}	1,1-Dimethylcyclohexane	.19±0.03	5	35
260-5S	C_8H_{16}	1-*cis*-2-Dimethylcyclohexane	.024±0.015	5	35
261-5S	C_8H_{16}	1,*trans*-2-Dimethylcyclohexane	.08±0.07	5	35
263-5S	C_8H_{16}	1,*cis*-3-Dimethylcyclohexane[g]	.09±0.05	5	35
262-5S	C_8H_{16}	1,*trans*-3-Dimethylcyclohexane[h]	.16±0.07	5	35
264-5S	C_8H_{16}	1,*cis*-4-Dimethylcyclohexane	.06±0.04	5	35
265-5S	C_8H_{16}	1,*trans*-4-Dimethylcyclohexane	.14±0.08	5	35
506-5S	C_9H_{18}	*n*-Propylcyclohexane	.08±0.05	5	25
507-5S	C_9H_{18}	Isopropylcyclohexane	.16±0.07	5	25
516-5S	C_9H_{18}	1,1,3-Trimethylcyclohexane	.21±0.05	5	50
508-5S	$C_{10}H_{20}$	*n*-Butylcyclohexane	.08±0.04	5	35
509-5S	$C_{10}H_{20}$	Isobutylcyclohexane	.17±0.09	5	35
510-5S	$C_{10}H_{20}$	*sec*-Butylcyclohexane	[d] .30±0.20	5	35
511-5S	$C_{10}H_{20}$	*tert*-Butylcyclohexane	.05±0.03	5	35
591-5S	$C_{10}H_{32}$	*n*-Decylcyclohexane	.14±0.11	5	35

See footnotes at end of tables.

3. Descriptive List of Standard Materials With Weights and Fees—Continued

3.2. Standards of Certified Properties or Purity—Continued

3.2.6. Hydrocarbons and Organic Sulfur Compounds—Continued

Sample No.[a]	Compound		Amount of impurity[b]	Volume per sample[c]	Price per sample
	Formula	Name			
		MONOOLEFINS			
			Mole percent	*ml*	
281–5S	C_5H_{10}	1–Pentene	0. 66 ± 0. 40	5	$25
284–5S	C_5H_{10}	2–Methyl-1-butene	. 14 ± 0. 08	5	25
286–5S	C_5H_{10}	2-Methyl-2-butene	. 06 ± 0. 04	5	25
519–5S	C_6H_{12}	1-Hexene	. 14 ± 0. 08	5	35
527–5S	C_6H_{12}	*trans*-2-Hexene	. 17 ± 0. 11	5	35
528–5S	C_6H_{12}	*cis*-3-Hexene	. 13 ± 0. 08	5	35
529–5S	C_6H_{12}	*trans*-3-Hexene	. 06 ± 0. 03	5	35
530–5S	C_6H_{12}	2-Methyl-1-pentene	. 19 ± 0. 09	5	35
531–5S	C_6H_{12}	3-Methyl-1-pentene	. 30 ± 0. 20	5	35
532–5S	C_6H_{12}	4-Methyl-1-pentene	. 18 ± 0. 12	5	35
533–5S	C_6H_{12}	2-Methyl-2-pentene	. 09 ± 0. 05	5	35
534–5S	C_6H_{12}	3-Methyl-*cis*-2-pentene	. 15 ± 0. 08	5	35
535–5S	C_6H_{12}	3-Methyl-*trans*-2-pentene	. 14 ± 0. 09	5	35
537–5S	C_6H_{12}	4-Methyl-*cis*-2-pentene	. 08 ± 0. 07	5	35
536–5S	C_6H_{12}	4-Methyl-*trans*-2-pentene	. 25 ± 0. 07	5	35
538–5S	C_6H_{12}	2-Ethyl-1-butene	. 10 ± 0. 04	5	35
539–5S	C_6H_{12}	2,3-Dimethyl-1-butene	. 14 ± 0. 13	5	35
287–5S	C_6H_{12}	3,3-Dimethyl-1-butene	. 09 ± 0. 06	5	35
540–5S	C_6H_{12}	2,3-Dimethyl-2-butene	. 10 ± 0. 05	5	35
520–5S	C_7H_{14}	1-Heptene	. 20 ± 0. 10	5	35
589–5S	C_7H_{14}	4-Methyl-1-hexene	. 22 ± 0. 16	5	35
547–5S	C_7H_{14}	4,4-Dimethyl-1-pentene	. 15 ± 0. 08	5	35
582–5S	C_7H_{14}	4,4-Dimethyl-*cis*-2-pentene	. 21 ± 0. 11	5	35
574–5S	C_7H_{14}	4,4-Dimethyl-*trans*-2-pentene	. 09 ± 0. 03	5	35
550–5S	C_7H_{14}	2,3,3-Trimethyl-1-butene	. 06 ± 0. 04	5	35
521–5S	C_8H_{16}	1-Octene	. 24 ± 0. 13	5	35
548–5S	C_8H_{16}	*trans*-4-Octene	. 16 ± 0. 11	5	35
545–5S	C_8H_{16}	2,4,4-Trimethyl-1-pentene	. 09 ± 0. 03	5	35
546–5S	C_8H_{16}	2,4,4-Trimethyl-2-pentene	. 08 ± 0. 05	5	35
551–5S	C_9H_{18}	1-Nonene	. 24 ± 0. 18	5	35
552–5S	$C_{10}H_{20}$	1-Decene	. 11 ± 0. 07	5	35
555–5S	$C_{11}H_{22}$	1-Undecene	. 09 ± 0. 08	5	35
584–5S	$C_{12}H_{24}$	1-Dodecene	. 13 ± 0. 07	5	35
590–5S	$C_{16}H_{32}$	1-Hexadecene	. 16 ± 0. 07	5	35
		DIOLEFINS			
			Mole percent	*ml*	
513–5S	C_4H_6	1,3-Butadiene	[f]0. 08 ± 0. 04	5	$25
565–5S	C_5H_8	1,4-Pentadiene	[f]. 07 ± 0. 05	5	35
558–5S	C_5H_8	2,3-Pentadiene	[f]. 15 ± 0. 07	5	35
553–5S	C_6H_{10}	1-5-Hexadiene	[f]. 11 ± 0. 08	5	35
		CYCLOMONOOLEFINS			
			Mole percent	*ml*	
288–5S	C_5H_8	Cyclopentene	0. 034 ± 0. 021	5	$25
522–5S	C_6H_{10}	Cyclohexene	. 023 ± 0. 020	5	35
557–5S	C_8H_{12}	4-Ethenyl-1-cyclohexene (4-vinyl-1-cyclohexene)	[f]. 10 ± 0. 07	5	35
		ACETYLENES			
			Mole percent	*ml*	
514–5S	C_4H_6	1-Butyne	0. 13 ± 0. 07	5	$25
515–5S	C_4H_6	2-Butyne	. 069 ± 0. 038	5	25

See footnotes at end of tables.

3.2. Standards of Certified Properties or Purity—Continued

3.2.6. Hydrocarbons and Organic Sulfur Compounds—Continued

Sample No.[a]	Compound: Formula	Compound: Name	Amount of impurity[b]	Volume per sample[c]	Price per sample
		ALKYL BENZENES			
			Mole percent	*ml*	
210b–8J	C_6H_6	Benzene	0. 023±0. 015	8	$18
211b–5	C_7H_8	Methylbenzene (toluene)[e]	. 03±0. 02	5	10
211a–8S	C_7H_8	Methylbenzene (toluene)[e]	. 04±0. 02	8	18
212a–8S	C_8H_{10}	Ethylbenzene	. 04±0. 02	8	18
212a–25	C_8H_{10}	Ethylbenzene	. 04±0. 02	25	35
213b–5	C_8H_{10}	1,2-Dimethylbenzene (*o*-xylene)	. 005±0. 004	5	10
213a–8S	C_8H_{10}	1,2-Dimethylbenzene (*o*-xylene)	. 010±0. 007	8	18
213a–25	C_8H_{10}	1,2-Dimethylbenzene (*o*-xylene)	. 010±0. 007	25	35
215d–5	C_8H_{10}	1,4-Dimethylbenzene (*p*-xylene)	. 05±0. 03	5	10
215b–8S	C_8H_{10}	1,4-Dimethylbenzene (*p*-xylene)	. 06±0. 03	8	18
215b–25	C_8H_{10}	1,4-Dimethylbenzene (*p*-xylene)	. 06±0. 03	25	35
221–5S	C_9H_{12}	*n*-Propylbenzene	. 25±0. 08	5	25
220–5	C_9H_{12}	Isopropylbenzene	. 07±0. 03	5	10
220–8S	C_9H_{12}	Isopropylbenzene	. 07±0. 03	8	18
220–25	C_9H_{12}	Isopropylbenzene	. 07±0. 03	25	35
246–5S	C_9H_{12}	1-Methyl-2-ethylbenzene	. 27±0. 07	5	35
247–5S	C_9H_{12}	1-Methyl-3-ethylbenzene	. 43±0. 15	5	35
248–5S	C_9H_{12}	1-Methyl-4-ethylbenzene	. 13±0. 03	5	35
249–5S	C_9H_{12}	1,2,3-Trimethylbenzene	. 018±0. 012	5	35
250–5S	C_9H_{12}	1,2,4-Trimethylbenzene	. 33±0. 20	5	35
251–5S	C_9H_{12}	1,3,5-Trimethylbenzene	. 05±0. 02	5	35
501–5S	$C_{10}H_{14}$	*n*-Butylbenzene	. 12±0. 08	5	35
502–5S	$C_{10}H_{14}$	Isobutylbenzene	. 13±0. 09	5	35
503–5S	$C_{10}H_{14}$	*sec*-Butylbenzene	. 12±0. 06	5	35
504–5S	$C_{10}H_{14}$	*tert*-Butylbenzene	. 06±0. 03	5	35
560–5S	$C_{10}H_{14}$	1-Methyl-3-isopropylbenzene	. 064±0. 038	5	35
571–5S	$C_{10}H_{14}$	1-Methyl-4-isopropylbenzene	. 05±0. 03	5	35
523–5S	$C_{10}H_{14}$	1,2-Diethylbenzene	. 05±0. 03	5	35
524–5S	$C_{10}H_{14}$	1,3-Diethylbenzene	. 07±0. 04	5	35
525–5S	$C_{10}H_{14}$	1,4-Diethylbenzene	. 07±0. 02	5	35
566–5S	$C_{10}H_{14}$	1,3-Dimethyl-5-ethylbenzene	. 11±0. 06	5	35
575–5S	$C_{10}H_{14}$	1,2,3,5-Tetramethylbenzene	. 08±0. 02	5	35
585–5S	$C_{10}H_{14}$	1,2,4,5-Tetramethylbenzene	. 14±0. 04	5	35
572–5S	$C_{11}H_{16}$	1-Methyl-3-*tert*-butylbenzene	. 08±0. 05	5	35
576–5S	$C_{11}H_{16}$	1-Methyl-4-*tert*-butylbenzene	. 05±0. 03	5	35
586–5S	$C_{16}H_{26}$	*n*-Decylbenzene	. 20±0. 16	5	35
		NAPHTHALENES			
			Mole percent	*ml*	
577–5S	$C_{10}H_8$	Naphthalene	0. 04±0. 03	5	$35
587–5S	$C_{10}H_{12}$	1,2,3,4-Tetrahydronaphthalene	. 14±0. 06	5	35
578–5S	$C_{11}H_{14}$	1-Methylnaphthalene	. 08±0. 03	5	35
579–5S	$C_{11}H_{14}$	2-Methylnaphthalene	. 09±0. 06	5	35
		POLYCYCLIC AROMATIC HYDROCARBONS			
			Mole percent	*ml*	
556–5S	C_9H_{10}	2,3-Dihydroindene (Indan)	0. 06±0. 02	5	$35
567–5S	$C_{10}H_{18}$	*cis*-Decahydronaphthalene (*cis*-Bicyclo [4.4.0] decane)	. 11±0. 05	5	35
561–5S	$C_{10}H_{18}$	*trans*-Decahydronaphthalene (*trans*-Bicyclo [4.4.0] decane)	. 04±0. 03	5	35

See footnotes at end of tables.

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3.2. Standards of Certified Properties or Purity—Continued

3.2.6. Hydrocarbons and Organic Sulfur Compounds—Continued

Sample No.[a]	Compound: Formula	Compound: Name	Amount of impurity[b]	Volume per sample[c]	Price per sample
		ORGANIC SULFUR COMPOUNDS[j]			
			Mole percent	*ml*	
904–5S	C_2H_6S	Ethanethiol (ethyl mercaptan)	0.05 ± 0.04	5	$35
907–5S	$C_2H_6S_2$	Methyldithiomethane (dimethyl disulfide)[k]	.03 ± 0.02	5	35
902–5S	C_3H_8S	Methylthioethane (methyl ethyl sulfide)[k]	.04 ± 0.04	5	35
901–5S	C_4H_4S	Thiophene	.013 ± 0.011	5	35
903–5S	$C_4H_{10}S$	Ethylthioethane (diethyl sulfide)[k]	.06 ± 0.04	5	35
905–5S	$C_4H_{10}S$	2-Methyl-2-propanethiol (*tert*-butyl mercaptan)	.08 ± 0.04	5	35
908–5S	$C_4H_{10}S_2$	Ethyldithiodisulfide (diethyl disulfide)[k]	.10 ± 0.08	5	35
906–5S	$C_5H_{10}S$	1-Pentanethiol (*n*-pentyl mercaptan)	.08 ± 0.05	5	35

[a] The designations following the sample numbers indicate the following: "-5S" or "8S", a sample of 5 ml or 8 ml sealed "in vacuum" in a special Pyrex-glass ampoule with internal "break-off" tip: "-5", "-25", or "-50", a sample of 5, 25, or 50 ml sealed "in vacuum" in a plain-glass ampoule. Sample numbers including small letters designate preparations made to replenish depleted stock. For example, in this list isopropylbenzene 220–5 and 220–25 are from one preparation and 220a–8S is from another.

[b] Unless otherwise indicated, the purity has been evaluated from measurements of freezing points. See J. Research NBS **35**, 355 (1945) RP1676.

[c] Tolerance approximately ±10 percent. All volumes have been estimated in the liquid state, including those of compounds normally solid.

[d] Estimated by analogy with isomers subjected to similar purification.

[e] Certified with regard to density and refractive index.

[f] Certified with regard to calorimetric heat of combustion.

[g] This isomer, formerly known as "*trans*", see Science **105**, 647 (1947), has the following properties: Boiling point at one atmosphere, 120.09 °C; refractive index, n_D at 25 °C, 1.4206; density at 25 °C, 0.7620 g/ml. See NBS Circular 461, p. 45 (1947).

[h] This isomer, formerly known as "*cis*", see Science **105**, 647 (1947), has the following properties: Boiling point at one atmosphere, 124.45 °C; refractive index, n_D at 25 °C, 1.4284; density at 25 °C, 0.7806 g/ml. See NBS Circular 461, p. 45 (1947).

[i] When sealed. Polymer formed may be removed as residue by simple vaporization of the sample "in vacuum" at an appropriate temperature.

[j] In the determination of the purity of these compounds, an apparatus providing no connection with the atmosphere was employed. See Anal. Chem. **22**, 1521 (1950).

[k] These compounds are here named in accordance with the recommendations of the International Union of Pure and Applied Chemistry. The samples themselves bear labels in accordance with recommendations made for the naming of sulfur compounds in petroleum. See Chem. and Eng. News **24**, 2765 (1946). The samples are labeled as follows: 907–5S, 2,3-dithiabutane; 902–5S, 2-thiabutane; 903–5S, 3-thiapentane; and 908–5S, 3,4-dithiahexane.

STANDARDS CERTIFIED FOR DENSITY AND REFRACTIVE INDEX

The following three compounds listed above are certified with respect to values of density, for air-saturated material at 1 atm, at 20, 25, and 30 °C, to ±0.00002 g/ml, and also with respect to values of refractive index, for each of seven wavelengths (helium 668 and 502, hydrogen 656 (C) and 486 (F), mercury 546 (e) and 436 (g), and sodium 589 (D_1, D_2) at 20, 25, and 30 °C to ±0.00002):

No. 217b	2,2,4-Trimethylpentane.
No. 218a	Methylcyclohexane.
No. 211a, 211b	Toluene.

These standards may be used to calibrate refractometers, picnometers, and density balances, as well as spectrometers. A certificate is supplied with each of these samples.

STANDARDS CERTIFIED FOR CALORIMETRIC HEAT OF COMBUSTION

Standard Sample 217b, 2,2,4-Trimethylpentane, is also certified with regard to the value for calorimetric heat of combustion, primarily for calibrating apparatus for determining the heating value of gasoline and other liquid fuels.

INSTRUCTIONS AND CONNECTING TUBES

A set of instructions for transferring standard samples of hydrocarbons "in vacuum" may be obtained on request.

The unsaturated hydrocarbons are usually sealed in ampoules of Pyrex Red glass. In order to facilitate the handling of these ampoules, the first shipment of those samples to a laboratory will include one graded connecting tube consisting of Pyrex Red to Pyrex Uranium to Pyrex clear glass.

AVAILABILITY

It is not planned to replenish the present stock of any of the hydrocarbons and organic sulfur compounds with new preparations, except those certified for density, refractive index and calorimetric heat of combustion (footnotes e and f).

ORDERS

Most of the standard hydrocarbons listed above were purified through a cooperative undertaking between the National Bureau of Standards and the American Petroleum Institute. The preparation of the organic sulfur compounds involved the cooperation of the U.S. Bureau of Mines at Laramie, Wyo. By agreement with the American Petroleum Institute, distribution of these two groups of standards by the National Bureau of Standards is limited to laboratories not directly associated with the petroleum industry. Orders from such laboratories should be sent to the National Bureau of Standards, Washington 25, D.C. Orders from laboratories that are associated with the petroleum industry should be placed with the American Petroleum Institute, Carnegie Institute of Technology, Pittsburgh, Pa.

In all cases, compounds should be specified by both name and sample number.

SHIPMENTS

All orders for hydrocarbons or organic sulfur compounds are shipped express collect.

3. Descriptive List of Standard Materials With Weights and Fees—Continued

3.2. Standards of Certified Properties or Purity—Continued

3.2.7. Viscometer Calibrating Liquids

These oils are not intended for use as permanent viscosity standards. They are not suitable for stockroom items and should be ordered only for immediate use. They are available only in containers of nominal 1-pint capacity. This quantity is sufficient for the calibration of most viscometers. In cases where a larger quantity (e.g., duplicate samples) is required, a satisfactory explanation of the need for the larger quantity must be given in the order or accompanying letter. All available liquids are hydrocarbon oils and are listed in the tables below.

(A) Oils for use with viscometers calibrated in units of absolute or kinematic viscosity. Price covers the sample and a report containing accurate values at the time of shipment, for absolute viscosity, kinematic viscosity, and density at the following temperatures:

Oils D through N	20 °C, 25 °C, 100 °F, and 210 °F
Oil OB	20 °C, 25 °C, and 40 °C
Oil P	30 °C, 40 °C, and 50 °C

Viscosity values at other temperatures in the range 20 to 100 °C (30 to 100 °C for oil P) are supplied as a special service. For oils D through N, the charge for this special service is $15.00 per sample per temperature. For oils OB and P, the charge is $32.00 per sample per temperature. These special service charges are in addition to the charge for the sample and usual report.

The approximate viscosities and the prices of the calibrating oils are as follows:

Oil	Absolute viscosity, in poises, at—				Kinematic viscosity, in stokes, at—				Price [1] per sample F.O.B. Washington, D.C.
	20 °C	25 °C	100 °F	210 °F	20 °C	25 °C	100 °F	210 °F	
D	0. 020	0. 018	0. 014	0. 006	0. 026	0. 023	0. 019	0. 008	$15. 00
H	. 074	. 063	. 044	. 013	. 091	. 078	. 055	. 017	15. 00
I	. 12	. 10	. 066	. 017	. 14	. 12	. 081	. 022	15. 00
J	. 21	. 17	. 11	. 023	. 25	. 21	. 13	. 028	15. 00
K	. 41	. 32	. 18	. 032	. 48	. 38	. 22	. 040	15. 00
L	1. 0	. 74	. 37	. 049	1. 1	. 84	. 43	. 060	15. 00
M	3. 0	2. 1	1. 0	. 099	3. 4	2. 4	1. 1	. 12	15. 00
N	14	9. 6	4. 0	. 25	16	11	4. 6	. 30	15. 00

Oil	Absolute 20 °C	Absolute 25 °C	Absolute 30 °C	Absolute 40 °C	Absolute 50 °C	Kinematic 20 °C	Kinematic 25 °C	Kinematic 30 °C	Kinematic 40 °C	Kinematic 50 °C	Price [1] per sample F.O.B. Washington, D.C.
OB	300	200	--------	55	--------	350	210	--------	60	--------	32. 00
P	--------	--------	450	200	95	--------	--------	510	220	100	32. 00

(B) Oils for use with Saybolt viscometers. Price covers the sample and a report containing an accurate value at the time of shipment, for viscosity at the indicated temperature. Viscosity values at other temperatures or in other units are not supplied. Saybolt viscosity values are based on determined values for kinematic viscosity and the standard conversion tables published by the American Society for Testing Materials.

The approximate viscosities and the prices of the Saybolt calibrating oils are as follows:

Oil	Temperature °F	Viscosity	Price [1] per sample F.O.B. Washington, D.C.
SB	100	300 seconds, Saybolt Universal	$6. 50
SF	122	110 seconds, Saybolt Furol	6. 50

[1] Because of the nature of the material, samples of oils for use as viscometer calibrating liquids will be shipped via railway express, express charges collect.

3.2.8. Surface Flammability Standards

Standard 1002	Surface Flammability Standard is being issued as follows: Hardboard sheet, 6×18 inches, for checking the operation of the radiant panel test equipment in accordance with Interim Federal Standard No. 00136 and later revisions. Flame Spread Index, I_s, = 150; Heat Evolution Factor, Q, = 33; Smoke Deposit, weight in mg, = 2.6. Price $8.00 per lot of four specimens.

3. Descriptive List of Standard Materials With Weights and Fees—Continued

3.2. Standards of Certified Properties or Purity—Continued

3.2.9. Radioactivity Standards [*]

Sample No.	Radiation	Nuclide	Nominal activity [a]	Volume	Price per sample
		ALPHA-, BETA-, GAMMA-RAY STANDARDS			
4900	α	Polonium-210 [b]	200 dps	([c])	$32.00
4901	α	Polonium-210 [b]	500 dps	([c])	32.00
4902	α	Polonium-210 [b]	1000 dps	([c])	32.00
4921	β (γ)	Sodium-22	10^4 dps/ml [e]	([f])	32.00
4922	γ (β)	Sodium-22	10^6 dps [g]	5.0 ml	32.00
4924	β	Carbon-14	10^3 dps/ml [e]	25.0 ml	32.00
4925	β	Carbon-14	10^4 dps/ml [e]	([h])	32.00
4926	β	Hydrogen-3	10^4 dps/ml [e]	25.0 ml	32.00
4927	β	Hydrogen-3	10^6 dps/ml [e]	([f])	32.00
4929	K	Iron-55	10^4 dps/l [e]	([f])	36.00
4930	γ (K)	Zinc-65	10^5 dps/ml [e]	([f]) ml	20.00
4935	β	Krypton-85	10^7 dps/g.mol [e]	([i])	32.00
4940	β	Promethium-147	10^5 dps/g [e]	([f])	40.00

Discontinued NBS radioactivity standards.—The National Bureau of Standards has discontinued distribution of the following radioactivity standards, Nos. 4910, 4911, 4912, 4913, 4914, 4915, 4916, 4917, 4918, 4919, 4920, 4923, 4928, 4931, 4933, 4934, 4936. Standardized samples of these radionuclides may now be obtained commercially.

[*] Radioactivity standards are shipped express collect only to destinations in Canada and the United States. In the case of shipments to other countries consignee should appoint an agent to handle shipment abroad, apply to the National Bureau of Standards for pro forma invoices, and establish a credit for the cost of the standards at any bank in the United States.

[a] The disintegration rate as of the reference date is given on a certificate accompanying the standard.

[b] Samples consist of a practically weightless deposit of polonium-210 on a monel disk 1 inch in diameter, 1/16-inch thick. Please note that standard samples Nos. 4900, 4901, and 4902 are now polonium-210. This change makes possible the preparation of small diameter weightless sources with little self-absorption and no beta emission. Corrections for decay may be made accurately.

[c] Deposited source.

[d] Samples consist of U_3O_8 deposited on a 0.1-mm platinum foil and mounted on an aluminum disk, 1 1/4 inch in diameter and 1/32-inch thick. The alpha-ray disintegration rate as of the date of calibration is indicated on the certificate accompanying the standard.

[e] Total activity of these standards is such that they may be ordered singly under the general licensing provisions of the Atomic Energy Act of 1954 (please refer to Federal Register, Volume 21, page 213, January 11, 1956).

[f] Approximately 3 ml of low-solids carrier solution containing the active nuclide in a flame-sealed ampoule.

[g] This standard can be issued only under the special licensing provisions of the Atomic Energy Act of 1954, and it is therefore required that a copy of the purchaser's current AEC By-Product Material license be on file at the National Bureau of Standards.

[h] Benzoic acid (7C-14) in about 3 ml of toluene in a flame-sealed glass ampoule.

[i] Approximately 10 ml of Kr^{85} in inert krypton at a pressure of approximately one atmosphere in a break-seal glass ampoule.

Sample No.	Radium content (grams)	Volume [j] (milliliters)	Price per sample
	RADIUM STANDARDS (FOR RADON ANALYSIS)		
4950	10^{-9}	100	$32.00
4951	10^{-11}	100	32.00
4952	Blank solution	100	7.50

[j] Samples are contained in flame-sealed glass ampoules.

Sample No.	Radium content (micrograms)	Volume [k] (milliliters)	Price per sample	Sample No.	Radium content (micrograms)	Volume [k] (milliliters)	Price per sample
	RADIUM GAMMA-RAY STANDARDS						
4955	0.1	5	$32.00	4960	5.0	5	$32.00
4956	0.2	5	32.00	4961	10	5	32.00
4957	0.5	5	32.00	4962	20	5	32.00
4958	1.0	5	32.00	4963	50	5	32.00
4959	2.0	5	32.00	4964	100	5	32.00

[k] Samples are contained in flame-sealed glass ampoules.

3. Descriptive List of Standard Materials With Weights and Fees—Continued

3.2. Standards of Certified Properties or Purity—Continued

3.2.9. Radioactivity Standards—Continued

CARBON-14 DATING STANDARD

Sample No.	Item	Price
4990	Contemporary Standard for Carbon-14 Dating Laboratories (sample consists of 5 lb of oxalic acid)	$5.00

Sample No.	Calibration	Nuclide	Nominal Activity	Price per sample
POINT SOURCE STANDARDS [1]				
4991	γ	Sodium-22	10^4 γps (e)	$32.00
4992	γ	Zinc-65	5×10^4 γps (e)	32.00
4996	γ	Sodium-22	5×10^4 γps (e)	32.00
4997–B	γ	Manganese-54	5×10^4 γps (e)	38.00

[1] These standards are deposited point sources between 2 layers of approximately 0.0025-in. polyester tape.

3.3. Standard Rubbers and Rubber Compounding Materials

3.3.1. Rubbers [a]

Sample No.	Name	Approximate weight of sample in grams	Price per sample	Sample No.	Name	Approximate weight of sample in grams	Price per sample
385b	Natural	31,500	([b])	387a	Styrene-butadiene, type 1000	34,000	$30.00
386b	Styrene-butadiene, type 1500	34,000	$32.00	388	Butyl	25,000	45.00

[a] Normally, samples are shipped railway express, express charges collect. [b] New lot to be established.

3.3.2. Rubber Compounding Materials [a]

370b	Zinc oxide	2,000	$3.25	377	Phenyl-beta-naphthylamine	600	$4.00
371c	Sulfur	1,400	2.25	378	Oil furnace black	7,000	3.50
372d	Stearic acid	600	1.90	379	Conducting black	5,500	3.50
373d	Benzothiazyl-disulfide	500	2.75	380	Calcium carbonate	6,000	2.50
374b	Tetramethylthiuram-disulfide	500	4.00	381	Calcium silicate	4,000	2.50
375d	Channel black	7,500	4.50	382	Gas furnace black	7,500	3.50
376a	Light magnesia	450	2.40	383	Mercaptobenzothiazole	800	2.75

[a] Normally, samples are shipped railway express, express charges collect.

3. Descriptive List of Standard Materials With Weights and Fees—Continued

3.4. Miscellaneous Standard Materials

3.4.1. Phosphors

Sample No.	Name	Approximate weight of sample in grams	Price	Sample No.	Name	Approximate weight of sample in grams	Price
1020	Zinc sulfide phosphor	14	$3.00	1026	Calcium tungstate phosphor	28	$3.00
1021	Zinc silicate phosphor	28	3.00	1027	Magnesium tungstate phosphor	28	3.00
1022	Zinc sulfide phosphor	14	3.00	1028	Zinc silicate phosphor	28	3.00
1023	Zinc-cadmium sulfide phosphor (Ag activator)	14	3.00	1029	Calcium silicate phosphor	14	3.00
				1030	Magnesium arsenate phosphor	28	3.00
1024	Zinc-cadmium sulfide phosphor (Cu activator)	14	3.00	1031	Calcium halophosphate phosphor	28	3.00
				1032	Barium silicate phosphor	28	3.00
1025	Zinc phosphate phosphor	28	3.00	1033	Calcium phosphate phosphor	28	3.00

3.4.2. Turbidimetric and Fineness Standard

Sample No.	Name	Constituents determined or intended use	Approximate weight of sample in grams	Price per sample
114j	Cement	No. 325 sieve residue, 7.6 Surface area, 1,890 cm^2/g Air permeability, 3,310 cm^2/g	20	$2.50

3.4.3. Glass Spheres for Sieve Sizing

Sample No.	Item	Price
1017	Calibrated Glass Spheres (for calibrating sieves No. 70–270)	$9.50
1018	Calibrated Glass Spheres (for calibrating sieves No. 20–70)	9.50

3.4.4. Paint-Pigment Standards for Color and Tinting Strength Only

Sample No.	Name	Approximate weight of sample in grams	Price per sample	Sample No.	Name	Approximate weight of sample in grams	Price per sample
300	Toluidine red toner	40	$3.00	314	Yellow iron oxide, light lemon	20	$3.00
301	Yellow ocher	45	3.00	315	Yellow iron oxide, lemon	20	3.00
302	Raw sienna	45	3.00	316	Yellow iron oxide, orange	25	3.00
303	Burnt sienna	50	3.00	317	Yellow iron oxide, dark orange	40	3.00
304	Raw umber	45	3.00	318	Lampblack	15	3.00
305	Burnt umber	50	3.00	319	Primrose chrome yellow	65	3.00
306	Venetian red	60	3.00	320	Lemon chrome yellow	60	3.00
				321	Medium chrome yellow	65	3.00
307	Metallic brown	60	3.00				
308	Indian red	50	3.00	322	Light chrome orange	100	3.00
309	Mineral red	65	3.00	323	Dark chrome orange	100	3.00
310	Bright red oxide	50	3.00	324	Ultramarine blue	37	3.00
311	Carbon black (high color)	10	3.00	325	Iron blue	25	3.00
312	Carbon black (all-purpose)	20	3.00	326	Light chrome green	60	3.00
313	Black iron oxide	42	3.00	327	Medium chrome green	50	3.00
				328	Dark chrome green	45	3.00

3. Descriptive List of Standard Materials With Weights and Fees—Continued

3.4. Miscellaneous Standard Materials—Continued

3.4.5. Light-Sensitive Papers

Sample No.	Item	Unit of issue	Price per set
700	Light-sensitive paper for calibration of carbon-arc fading lamps for color-fastness tests of textiles. See current NBS Letter Circular 1036 on this subject for directions for use.	Package of 100 pieces.	$3.00
701	Booklet of standard faded strips of light-sensitive paper for use with above sample. See the current NBS Letter Circular 1036 for directions for use.	Booklet	40.00

3.4.6. Standard Colors for Kitchen and Bathroom Accessories [a]

Sample No.	Item	Unit of issue	Price per set
1000	Enameled iron plaques, 3 by 5 inches, in accordance with Commercial Standards CS62–38 and CS63–38.	Set of 10	$10.00

[a] Calibration of these standards for use with three-filter reflectometers may be obtained by applying to the Bureau.

3.4.7. Microcopy Resolution Test Chart [a]

Sample No.	Item	Unit of issue (minimum)	Price per chart
1010	Resolution chart for testing the resolving power of micro copying cameras	5 charts	$0.20

[a] These charts are made photographically, and consist of line patterns, the lines and spaces being of equal width. Each pattern contains two sets of lines, one set at right angles to the other. The patterns range from 1 to 10 lines per millimeter. Instructions for the use of these charts are furnished with each order.

4. Summary of Analyses

The values given in the following sections are listed primarily as a guide to purchasers. In some cases provisional values are given which may differ slightly from those given on the certificates. For this reason *the certificates issued with the standards should always be consulted to obtain the proper values.*

4.1. Averaged Analyses

ALUMINUM-BASE ALLOYS (CHEMICAL STANDARDS)

Sample No.	Cu	Mn	Si	Mg	Fe	Ti	Zn	Pb	V	Ga	Ni	Cr
85b	3.99	0.61	0.18	1.49	0.24	0.022	0.030	0.021	0.006	0.019	0.084	0.211
86c	7.92	.041	.68	0.002	.90	.035	1.50	.031	-------	-------	.030	.029
87a	0.30	.26	6.24	.37	.61	.18	0.16	.10	.01	.02	.57	.11

COBALT-BASE ALLOYS

Sample No.	Kind	Co	Ni	Cr	Mo	W	Nb	Ta	Fe	Mn	C	P	S	Si	Cu	V	Ti
167	Heat-resisting alloy (S816)	42.90	20.65	20.00	3.90	4.50	3.15	0.08	2.13	1.64	0.38	0.010	0.007	0.44	0.03	0.01	----
168	Heat-resisting alloy (S816)	41.20	20.25	20.33	3.95	3.95	2.95	.95	3.43	1.50	.37	.008	.005	.80	.035	.03	0.06

4. Summary of Analyses—Continued

4.1. Averaged Analyses—Continued

COPPER-BASE ALLOYS

Sample No.	Kind	Cu	Zn	Sn	Pb	Ni	Fe	Al	Mn
37e	Sheet brass	69. 61	27. 85	1. 00	1. 00	0. 53	0. 004		
52c	Cast bronze	89. 25	2. 12	7. 85	0. 011	. 76	. 004		
62d	Manganese bronze	59. 07	37 14	0. 38	. 23	. 28	. 86	1. 23	0. 66
63c	Phosphor bronze	80. 48	0. 093	9. 03	9. 35	. 32	. 0013		
124d	Ounce metal	83. 60	5. 06	4. 56	5. 20	. 99	. 18		
158	Silicon bronze	90. 86	2. 07	0. 97	0. 004	. 006	1. 48	0. 54	1. 31
164a	Aluminum bronze	82. 25	0. 07	. 04	. 04	3. 72	4. 05	9. 59	0. 22
184	Leaded-tin bronze	88. 96	2. 69	6. 38	1. 44	0. 50	0. 005		
157a	Nickel silver	58. 61	29. 09	0. 02	0. 03	11. 82	. 17		. 17

Sample No.	Kind	Sb	As	Ag	Si	S	P	Co
52c	Cast bronze					0. 002	0. 001	
62d	Manganese bronze				0. 075			
63c	Phosphor bronze	0. 52	0. 023			. 060	. 145	
124d	Ounce metal	. 17	. 02	0. 02		. 093	. 02	
158	Silicon bronze				2. 72			
164a	Aluminum bronze				0. 03			0. 01
184	Leaded-tin bronze						. 009	
157a	Nickel silver						. 01	. 02

LEAD- AND TIN-BASE ALLOYS

Sample No.	Kind	Pb	Sn	Sb	Bi	Cu	Fe	As	Ag	Ni	Al
53d	Lead-base		4. 94	9. 92	0. 13	0. 27		0. 045		0. 002	
127a	Solder		30. 03	0. 79	. 036	. 004		. 129	0. 004	. 002	
54d	Tin-base	0. 62	88. 57	7. 04	. 04	3. 62	0. 03	. 09	. 003	. 003	

MAGNESIUM-BASE ALLOY

Sample No.	Al	Zn	Mn	Si	Cu	Pb	Fe	Ni
171	2. 98	1. 05	0. 45	0. 012	0. 011	0. 0033	0. 0018	0. 0009

4. Summary of Analyses—Continued

4.1. Averaged Analyses—Continued

NICKEL-BASE ALLOYS (CHEMICAL STANDARDS)

Sample No.	Kind	Ni	Cu	Mn	Si	Co	Fe	Cr	Al	Ti	C	S
161	Ni-base casting	64.29	0.045	1.28	1.56	0.47	15.01	16.88			0.342	0.006
169	Ni-Cr	77.26	.015	0.073	1.42	.19	0.54	20.26	0.095	0.006	.043	.002
162a	Monel type	63.95	30.61	1.60	0.93	.076	2.19	0.042	.50	.005	.079	.007
349	Waspaloy	57.15	0.006	0.43	.29	13.95	0.13	19.50	1.23	3.05	.08	

Sample No.	Kind	P	Zr	V	Ca	N	Mo	W	B	Nb	Ta
161	Ni-base casting	0.012		0.029		0.027	0.005				
169	Ni-Cr		0.042	.018	0.015	.031					
162a	Monel type										
349	Waspaloy	.002	.081				4.04	<0.01	0.0046	<0.01	<0.01

TITANIUM- AND ZIRCONIUM-BASE ALLOYS (CHEMICAL STANDARDS)

Sample	Kind	Al	V	Mn	Fe	Cr	Si	Mo	C	N	Sn	Ni	Cu
173	Al6-V4	5.42	4.09		0.16		0.045			0.018			
174	Al4-Mn4	4.27		4.57	.18		.015			.012			
360	Zircaloy-2			0.001_2	.156	.114			<0.01		1.43	0.052	0.001_0

ZINC-BASE DIE-CASTING ALLOY (CHEMICAL STANDARD)

Sample No.	Al	Cu	Mg	Fe	Mn	Pb	Ni	Sn	Cd
94b	4.07	1.01	0.042	0.018	0.014	0.006	0.006	0.006	0.002

STEEL-MAKING ALLOYS

Sample No.	Kind	C	Mn	P	S	Si	V	Ti	Al	Ca	Fe	Cr
57	Refined silicon	0.087	0.034	0.008	0.005	96.8		0.10	0.67	0.73	0.65	0.025

Sample No.	Kind	C	Mn	P	S	Si	B	Cr	V	Al	N
61a	Ferrovanadium	1.06	1.78	0.119	0.005	5.12		0.68	50.19	0.02	
64b	Ferrochromium	4.30	0.21	.012	.062	1.43		68.0	0.15		0.032
66a	Spiegeleisen	4.39	19.77	.049	.021	2.26					
90	Ferrophosphorus			26.2							
172	Ferroboron	0.234				3.63	13.68			.05	
71	Calcium molybdate	Mo=35.3; Fe=1.92; Ti=0.06.									

4. Summary of Analyses—Continued

4.1. Averaged Analyses—Continued

Sample No.	Kind	C		Mn	P	S		Si	Cu	Ni
		Total	Graphitic			By oxidation	Evolved as H_2S			
					IRONS (CHEMICAL STANDARDS)					
3	White	2. 27	<0. 01	0. 350	0. 123	0. 089	------	0. 99	0. 126	0. 019
4i	Cast	3. 26	2. 64	. 793	. 130	. 054	0. 054	1. 45	. 253	. 062
5k	Cast	2. 71	1. 99	. 536	. 263	. 100	. 096	2. 08	1. 50	. 051
6f	Cast	2. 91	2. 19	. 499	. 530	. 106	. 103	1. 85	0. 252	. 060
7g	Cast	2. 69	2. 59	. 612	. 794	. 061	. 060	2. 41	. 128	. 120
55e	Ingot	0. 011	------	. 035	. 003	. 012	. 012	0. 001	. 065	. 038
82a	Ni-Cr	2. 24	1. 71	. 649	. 053	. 102	. 094	2. 07	. 076	1. 07
107b	Ni-Cr-Mo	2. 76	1. 88	. 52	. 058	. 068	------	1. 35	. 25	2. 12
115a	Ni-Cr-Cu	2. 63	1. 96	1. 01	. 086	. 065	------	2. 13	5. 51	14. 5
122d	Cast (car-wheel)	3. 28	2. 49	0. 504	. 280	. 092	. 092	0. 624	0. 054	0. 029
341	Ductile	1. 81	1. 22	. 91	. 023	. 007	------	2. 45	. 15	20. 3
342	Nodular	2. 45	2. 14	. 369	. 020	. 014	------	2. 85	. 14	0. 023
					STEELS (CHEMICAL STANDARDS)					
8i	Bessemer	0. 077	------	0. 511	0. 080	0. 063	0. 065	0. 020	0. 016	0. 009
10g	Bessemer	. 240	------	. 850	. 086	. 109	. 110	. 020	. 008	. 005
170a	B.O.H. (Ti-bearing)	. 052	------	. 325	. 005	. 021	------	. 036	. 059	. 026
15f	B.O.H	. 084	------	. 390	. 006	. 032	. 033	. 042	. 085	. 029
11g	B.O.H	. 191	------	. 513	. 008	. 026	. 026	. 203	. 046	. 020
12g	B.O.H	. 389	------	. 716	. 014	. 030	. 030	. 187	. 125	. 060
152	B.O.H. (Tin-bearing)	. 466	------	. 782	. 019	. 027	. 027	. 244	. 127	. 062
13f	B.O.H	. 629	------	. 889	. 020	. 016	. 016	. 236	. 103	. 113
14d	B.O.H	. 841	------	. 399	. 014	. 027	. 027	. 126	. 084	. 041
16d	B.O.H	1. 01	------	. 439	. 014	. 033	. 034	. 188	. 052	. 022
19f	A.O.H	0. 193	------	. 497	. 029	. 043	. 041	. 204	. 151	. 317
20f	A.O.H	. 380	------	. 754	. 028	. 034	. 032	. 299	. 238	. 243
51b	Electric furnace	1. 21	------	. 573	. 013	. 014	. 015	. 246	. 071	. 053
65d	Basic electric	0. 264	------	. 730	. 015	. 010	. 010	. 370	. 051	. 060
100b	Manganese (SAE T1340)	. 397	------	1. 89	. 023	. 029	. 028	. 210	. 064	. 030
105	High-sulfur	. 193	------	------	------	------	------	------	------	------
125a	High-silicon	. 032	------	0. 052	. 006	. 013	------	3. 32	. 084	. 053
129b	High-sulfur (SAE X1112)	. 094	------	. 763	. 085	. 221	------	0. 021	. 015	. 013
130a	Lead-bearing	. 182	------	. 753	. 016	. 019	. 019	. 173	. 027	. 010
151	Boron	------	------	------	------	------	------	------	------	------
30e	Cr-V steel (SAE 6150)	. 505	------	. 786	. 026	. 035	. 036	. 269	. 094	. 027
32e	Cr-Ni steel (SAE 3140)	. 409	------	. 798	. 008	. 022	. 021	. 278	. 127	1. 19
33d	Ni-Mo steel (SAE 4820)	. 173	------	. 537	. 006	. 010	. 010	. 253	. 123	3. 58
72f	Cr-Mo steel (SAE X4130)	. 301	------	. 545	. 014	. 024	------	. 256	. 062	0. 055
111b	Ni-Mo steel (SAE 4620)	. 193	------	. 706	. 012	. 015	. 013	. 302	. 028	1. 81
36a	Cr2-Mo1	. 120	------	. 432	. 014	. 016	------	. 356	. 114	0. 243
106b	Cr-Mo-Al	. 326	------	. 506	. 008	. 016	. 016	. 274	. 117	. 217
139a	Cr-Ni-Mo (AISI 8640)	. 404	------	. 780	. 013	. 019	. 020	. 241	. 096	. 510
156	Cr-Ni-Mo (NE 9450)	. 515	------	1. 40	. 032	. 017	. 017	. 226	. 053	. 475
159	Cr1-Mo0.4-Ag0.1	. 521	------	0. 807	. 036	. 027	. 026	. 258	. 181	. 137
50c	W18-Cr4-V1	. 719	------	. 342	. 022	. 010	------	. 311	. 079	. 069
132a	W6-Mo5-Cr4-V2	. 825	------	. 268	. 029	. 005	------	. 190	. 120	. 137
134a	W2-Mo8-Cr4-V1	. 808	------	. 218	. 018	. 007	------	. 323	. 101	. 088
153a	W2-Mo9-Cr4-V2-Co8	. 902	------	. 192	. 023	. 007	------	. 270	. 094	. 168
155	W0.5-Cr0.5	. 905	------	1. 24	. 015	. 010	------	. 322	. 083	. 100
73b	Cr13 (SAE 420)	. 355	------	0. 361	. 019	. 006	------	. 437	. 125	. 197
133a	Cr13-Mo0.3-S0.3	. 120	------	1. 03	. 026	. 326	------	. 412	. 118	. 241
101e	Cr18-Ni9 (SAE 304)	. 054	------	1. 77	. 025	. 010	------	. 43	. 359	9. 48
121c	Cr18-Ni10-Ti0.4 (SAE 321)	. 038	------	1. 31	. 028	. 009	------	. 64	. 14	10. 51
123b	Cr-Ni-Nb-Ta (SAE 347)	------	------	------	. 024	------	------	. 52	------	------
160a	Cr-Ni-Mo (SAE 316)	. 062	------	1. 62	. 027	. 015	------	. 605	. 174	14. 13
166b	Cr-Ni	. 019	------	------	------	------	------	------	------	------
126b	Ni36	. 090	------	0. 380	------	------	------	. 200	. 082	35. 99

4. Summary of Analyses—Continued

4.1. Averaged Analyses—Continued

Sample No.	Cr	V	Mo	W	Co	Ti	As	Sn	Al (total)	Mg	N	Nb	Ta	B
IRONS (CHEMICAL STANDARDS)—Continued														
3	0.051	0.008	0.005	---	---	0.010	---	---	---	---	0.010	---	---	0.0007
4i	.104	.013	.003	---	---	.026	0.018	---	---	---	.006	---	---	---
5k	.109	.014	.007	---	---	.028	.027	---	---	---	.009	---	---	---
6f	.442	.032	.009	---	---	.063	.032	---	---	---	.005	---	---	---
7g	.048	.010	.012	---	---	.044	.014	---	---	---	.004	---	---	---
55e	.006	<.001	.011	---	0.007	---	.007	0.007	0.002	---	.004	---	---	---
82a	.323	.019	.008	---	---	.065	---	---	---	---	---	---	---	---
107b	.56	.008	.75	---	---	---	---	---	---	---	---	---	---	---
115a	1.98	.015	.050	---	---	.020	---	---	---	---	---	---	---	---
122d	0.032	.011	.004	---	---	.007	.021	---	---	---	.004	---	---	---
341	1.98	.012	.011	---	---	.018	---	---	---	0.068	---	---	---	---
342	0.032	.004	.009	---	---	.019	---	---	---	.053	---	---	---	---
STEELS (CHEMICAL STANDARDS)—Continued														
8i	0.009	0.012	0.003	---	---	---	---	---	---	---	0.018	---	---	---
10g	.008	.007	.002	---	---	---	---	---	---	---	.015	---	---	---
170a	.014	.009	.005	Zirconium 0.037	---	0.281	---	0.006	0.046	---	.005	---	---	---
15f	.009	.001	.006	---	---	---	---	---	---	---	.005	---	---	---
11g	.015	.001	.005	---	---	---	---	.004	---	---	.006	---	---	---
12g	.046	.002	.010	---	---	---	---	---	---	---	.003	---	---	---
152	.050	.001	.013	---	---	---	---	.036	---	---	.004	---	---	---
13f	.129	.002	.033	---	---	---	---	---	---	---	.004	---	---	---
14d	.065	.002	.007	---	---	---	---	---	---	---	.004	---	---	---
16d	.042	.002	.006	---	---	---	---	---	---	---	.003	---	---	---
19f	.053	.007	.058	---	---	---	---	.022	---	---	---	---	---	---
20f	.097	.007	.058	---	---	---	---	.021	---	---	.005	---	---	---
51b	.455	.002	.014	---	---	---	---	.008	---	---	.011	---	---	---
65d	.049	.002	.025	---	---	---	---	.004	.059	---	.013	---	---	---
100b	.063	.003	.237	---	---	---	---	---	---	---	.004	---	---	---
105	---	---	---	---	---	---	---	---	---	---	---	---	---	---
125a	.023	.001	.007	---	---	<0.01	---	.007	<0.01	---	.002	---	---	<0.001
129b	.016	.004	.003	---	---	---	---	---	---	---	.014	---	---	---
130a	.012	.001	.004	---	Lead 0.228	---	---	---	---	---	.008	---	---	---
151	---	---	---	---	---	---	---	---	---	---	---	---	---	.0027
30e	.934	.149	.007	---	---	---	---	---	---	---	.007	---	---	---
32e	.678	.002	.023	---	---	---	---	.011	---	---	.009	---	---	---
33d	.143	.002	.246	---	---	---	---	---	---	---	.011	---	---	---
72f	.891	.005	.184	---	---	---	---	---	---	---	.009	---	---	---
111b	.070	.003	.255	---	---	---	---	---	.043	---	---	---	---	---
36a	2.41	.006	.920	---	---	---	---	.011	---	---	---	---	---	---
106b	1.18	.003	.199	---	---	---	---	---	1.07	---	---	---	---	---
139a	0.486	.003	.183	---	---	---	---	---	---	---	.008	---	---	---
156	.429	.002	.138	---	---	---	---	---	---	---	---	---	---	---
159	1.00	.054	.414	---	---	---	---	---	Silver 0.090	---	---	---	---	---
50c	4.13	1.16	.082	18.44	---	---	.022	.018	---	---	.012	---	---	---
132a	4.21	1.94	4.51	6.20	---	---	---	---	---	---	---	---	---	---
134a	3.67	1.25	8.35	2.00	---	---	---	---	---	---	---	---	---	---
153a	3.72	2.06	8.85	1.76	8.47	---	---	---	---	---	.024	---	---	---
155	0.485	0.014	0.039	0.517	---	---	---	---	---	---	---	---	---	---
73b	12.82	.032	.014	---	---	---	---	---	---	---	.052	---	---	---
133a	12.89	.026	.294	---	---	---	---	---	---	---	.032	---	---	---
101e	17.98	.043	.426	.056	0.18	---	---	.020	---	---	.039	0.013	---	---
121c	17.58	.048	.16	---	---	.42	---	---	---	---	---	---	---	---
123b	---	.05	.17	.18	---	.006	---	---	---	---	---	.75	0.20	---
160a	18.74	.051	2.83	---	.071	---	---	.013	---	---	.051	---	---	---
166b	---	---	---	---	---	---	---	---	---	---	---	---	---	---
126b	0.066	.001	0.006	---	.032	---	---	---	---	---	---	---	---	---

4. Summary of Analyses—Continued

4.1. Averaged Analyses—Continued

Sample Nos.[a]			Kind	C	Mn	P	Si	Cu	Ni	Cr	V
			INGOT IRON AND LOW-ALLOY STEELS (SPECTROSCOPIC STANDARDS)								
402	802		B.O.H., 0.8 C	([c])	0.46	------	0.060	0.025	0.010	0.025	------
([b])	803a		A.O.H., 0.6 C	------	1.04	------	.34	.096	.190	.101	0.005
404a	804a		Basic electric	------	0.88	------	.44	.050	.040	.025	.002
405a	805a		Medium manganese	------	1.90	------	.27	.032	.065	.037	------
407a	807a		Chromium-vanadium	------	0.76	------	.29	.132	.169	.92	.146
408a	808a		Chromium-nickel	------	.76	------	.28	.10	1.20	.655	.002
409b	809b		Nickel	------	.46	------	.27	.104	3.29	.072	.002
410a	810a		Cr2-Mo1	------	------	------	.36	.11	0.24	2.39	------
([b])	811a		Cr-Mo (SAE X4130)	------	------	------	.29	.105	.24	0.93	.002
([b])	812a		Cr-Ni-Mo (NE 8637)	------	.87	------	.30	.090	.56	.55	------
413	([b])		A.O.H., 0.4 C	------	.67	------	.22	.25	.18	.055	.007
414	([b])		Cr-Mo (SAE 4140)	------	.67	------	.26	.11	.080	.99	.003
415a	([b])		Bessemer, 0.5 C	------	------	------	.10	.012	.006	.008	.006
416a	([b])		Nitralloy G	------	.54	------	.25	.15	.28	1.14	------
417	([b])		A.O.H., 0.4 C	------	.64	------	.18	------	.105	0.028	.004
417a	817a		B.O.H., 0.4 C	------	.78	------	------	.13	.062	.050	------
418	([b])		Cr-Mo (SAE X4130)	------	.52	------	.28	------	.11	.96	------
418a	818a		Cr-Mo (SAE X4130)	------	.52	------	.27	.040	.125	1.02	------
420a	820a		Ingot Iron	------	.017	------	------	.027	.0092	0.0032	------
421	821		Cr-W, 0.9 C	------	1.24	------	------	.080	.10	.49	.012
427	827		Cr-Mo (SAE 4150) (B only)	------	------	------	------	------	------	------	------
			SPECIAL INGOT IRONS AND LOW-ALLOY STEELS[d] (SPECTROSCOPIC STANDARDS)								
461	1161		Low-Alloy Steel A	0.15	0.36	0.053	0.047	0.34	1.73	0.13	0.024
462	1162		Low-Alloy Steel B	.40	.94	.045	.28	.20	0.70	.74	.058
463	1163		Low-Alloy Steel C	.19	1.15	.031	.41	.47	.39	.26	.10
464	1164		Low-Alloy Steel D	.54	1.32	.017	.48	.094	.135	.078	.295
465	1165		Ingot Iron E	.037	0.032	.008	.029	.019	.026	.004	.002
466	1166		Ingot Iron F	.065	.113	.012	.025	.033	.051	.011	.007
467	1167		Low-Alloy Steel G	.11	.275	.033	.26	.067	.088	.036	.041
468	1168		Low-Alloy Steel H	.26	.47	.023	.075	.26	1.03	.54	.17
			STAINLESS STEELS[e] GROUP I (SPECTROSCOPIC STANDARDS)								
442	([b])		Cr16-Ni10	------	2.88	------	[f] (0.09)	0.11	9.9	16.1	0.032
443	([b])		Cr18.5-Ni9.5	------	3.38	------	(.15)	.14	9.4	18.5	.064
444	([b])		Cr20.5-Ni10	------	4.62	------	(.65)	.24	10.1	20.5	.12
			STAINLESS STEELS[e] GROUP II (SPECTROSCOPIC STANDARDS)								
445	845	D845	Cr13-Mo0.9 (Modified AISI 410)	------	0.77	------	0.52	0.065	0.28	13.31	(0.05)
446	846	D846	Cr18-Ni9 (Modified AISI 321)	------	.53	------	1.19	.19	9.11	18.35	(.03)
447	847	D847	Cr24-Ni13 (Modified AISI 309)	------	.23	------	0.37	.19	13.26	23.72	(.03)
448	848	D848	Cr9-Mo0.3 (Modified AISI 403)	------	2.13	------	1.25	.16	0.52	9.09	(.02)
449	849	D849	Cr5.5-Ni6.5	------	1.63	------	0.68	.21	6.62	5.48	(.01)
450	850	D850	Cr3-Ni25	------	------	------	.12	.36	24.8	2.99	(.006)

[a] Sizes: 400 series, rods 7/32 in. in diameter, 4 in. long; 800 series, rods 1/2 in. in diameter, 2 in. long; 1100 series, disks 1 1/4 in. in diameter, 3/4 in. thick (suitable for optical and X-ray analysis); D800 series, 1 1/4 in. in diameter, 1/4 in. thick (suitable only for X-ray analysis—prepared from the rods 1/2 in. in diameter by upset forging).

[b] The standard is available in only one size.

[c] The carbon contents of this group of steel standards are between 0.1 and 0.9 percent.

[d] Additional information on nitrogen, silver, germanium, and oxygen is available on the provisional certificate.

4. Summary of Analyses—Continued

4.1. Averaged Analyses—Continued

Sample Nos.[a]			Mo	W	Co	Ti	As	Sn	Al (total)	Nb	Ta	B	Pb	Zr	Zn
INGOT IRON AND LOW-ALLOY STEELS (SPECTROSCOPIC STANDARDS)—Continued															
402	802		------	------	------	------	------	------	------	------	------	------	------	------	------
(b)	803a		0.033	------	------	------	------	------	------	------	------	------	------	------	------
404a	804a		.007	------	------	------	------	------	------	------	------	------	------	------	------
405a	805a		.005	------	------	------	------	------	0.056	------	------	------	------	------	------
407a	807a		------	------	------	------	------	------	------	------	------	------	------	------	------
408a	808a		.065	------	------	------	------	------	------	------	------	------	------	------	------
409b	809b		.009	------	0.025	------	------	0.012	------	------	------	------	------	------	------
410a	810a		.91	------	------	------	------	------	------	------	------	------	------	------	------
(b)	811a		.22	------	------	------	------	------	------	------	------	------	------	------	------
(b)	812a		.18	------	------	------	------	------	------	------	------	------	------	------	------
413	(b)		.006	------	------	------	------	------	------	------	------	------	------	------	------
414	(b)		.32	------	------	------	------	.014	.020	------	------	------	------	------	------
415a	(b)		------	------	------	------	------	------	.11	------	------	------	------	------	------
416a	(b)		.20	------	------	------	------	.011	1.08	------	------	------	------	------	------
417	(b)		------	------	------	------	------	.020	0.013	------	------	------	------	------	------
417a	817a		.013	------	------	------	------	.036	------	------	------	------	------	------	------
418	(b)		.22	------	------	------	------	------	------	------	------	------	------	------	------
418a	818a		.21	------	------	------	------	------	------	------	------	------	------	------	------
420a	820a		.0013	------	.006	------	------	.0017	.003	------	------	------	------	------	------
421	821		.040	0.52	------	------	------	------	------	------	------	------	------	------	------
427	827		------	------	------	------	------	------	------	------	------	0.0027	------	------	------
INGOT IRONS AND SPECIAL LOW-ALLOY STEELS [d] (SPECTROSCOPIC STANDARDS)—Continued															
461	1161		0.30	0.012	0.26	[f](0.01)	0.028	0.022	(0.005)	0.011	0.002	0.0002	(0.003)	(<0.005)	------
462	1162		.080	.053	.11	.037	.046	.066	.023	.096	.036	.0005	.006	.063	------
463	1163		.12	.105	.013	.010	.10	.013	.027	.195	.15	.0012	.012	.20	------
464	1164		.029	.022	.028	.004	.018	.043	.005	.037	.069	.005	.020	.010	------
465	1165		.005	(.001)	.008	.20	.010	.001	.19	(.001)	.001	.0001	(<.0005)	(.002)	------
466	1166		.011	(.006)	.046	.057	.014	.005	.015	.005	.002	(.0002)	(.0013)	(<.005)	------
467	1167		.021	.20	.074	.26	.14	.10	.16	.29	.23	(.0002)	.0006	.094	------
468	1168		------	.077	.16	.011	.008	.009	.042	.006	.005	.009	(<.0005)	(<.005)	------
STAINLESS STEELS [e] GROUP I (SPECTROSCOPIC STANDARDS)—Continued															
442	(b)		0.12	(0.08)	0.13	0.002	------	0.0035	------	0.032	(0.0006)	0.0005	0.0017	(0.004)	(0.003)
443	(b)		.12	(.09)	.12	.003	------	.006	------	.056	(.0008)	.0012	.0025	------	(.005)
444	(b)		.23	(.17)	.22	.019	------	.014	------	.20	(.004)	.0033	.0037	(.011)	(.004)
STAINLESS STEELS [g] GROUP II (SPECTROSCOPIC STANDARDS)—Continued															
445	845	D845	0.92	(0.42)	------	(0.03)	------	------	------	0.11	(0.002)	------	------	------	------
446	846	D846	.43	(.04)	------	(.34)	------	(0.02)	------	.60	(.030)	------	------	------	------
447	847	D847	.059	(.06)	------	(.02)	------	------	------	.03	(.002)	------	------	------	------
448	848	D848	.33	(.14)	------	(.23)	------	(.05)	------	.49	(.026)	------	------	------	------
449	849	D849	.15	(.19)	------	(.11)	------	(.07)	------	.31	(.021)	------	------	------	------
450	850	D850	------	(.21)	------	(.05)	------	(.09)	------	.05	(.002)	------	------	------	------

[e] By difference, the approximate iron contents of the standards are: 442–70.5%; 443–68.1%; 444–62.9%.

[f] Values in parentheses are *not* certified, but are given for additional information on the composition.

[g] The carbon contents of this group of standards are between 0.06 and 0.1 percent; phosphorus 0.02 and 0.03 percent; and sulfur 0.01 and 0.02 percent. By difference, the approximate iron contents are: 445, 845, and D845–83.2%; 446, 846, and D846–68.8%; 447, 847, and D847–61.8%; 448, 848, and D848–85.3%; 449, 849, and D849–84.2%; 450, 850, and D850–70.8%.

4. Summary of Analyses—Continued

4.1. Averaged Analyses—Continued

TOOL STEELS (SPECTROSCOPIC STANDARDS)

Sample Nos. [a]			Kind	Mn	Si	Cu	Cr	V	Mo	W	Co
436	836	D836	Special (Cr6-Mo3-W10) [b]	0. 21	0. 32	0. 075	6. 02	0. 63	2. 80	9. 7	------
437	837	D837	Special (Cr8-Mo2-W3-Co3)	. 48	. 53	------	7. 79	3. 04	1. 50	2. 8	2. 9
438	838	D838	Mo High Speed (AISI-SAE M30)	. 20	. 17	. 17	4. 66	1. 17	8. 26	1. 7	4. 9
439	839	D839	Mo High Speed (AISI-SAE M36)	. 18	. 21	. 12	2. 72	1. 50	4. 61	5. 7	7. 8
440	840	D840	Special W High Speed (Cr2-W13-Co12)	. 15	. 14	. 059	2. 12	2. 11	0. 070	13. 0	11. 8
441	841	D841	W High Speed (AISI-SAE T1)	. 27	. 16	. 072	4. 20	1. 13	. 84	18. 5	------

[a] Sizes: 400 series, rods 7/32 in. in diameter, 4 in. long; 800 series, rods ½ in. in diameter, 2 in. long: D800 series, 1¼ in. in diameter, ¼ in. thick (suitable only for X-ray analysis prepared from the rods ½ in. in diameter by upset forging).

[b] The carbon contents of this group of standards are between 0.7 and 0.8%. By difference, the approximate iron contents are: 436, 836, and D836—79.2% 437, 837, and D837—79.7%; 438, 838, and D838—77.6%; 439, 839, and D839—76.0%; 440, 840, and D840—69.1%; 441, 841, and D841—73.6%.

WHITE-CAST IRONS (SPECTROSCOPIC STANDARDS)

Sample No. [a]	C [b]	Mn	P	S	Si	Cu	Ni	Cr	V	Mo
[c] 1176	3. 47	0. 63	0. 42	0. 061	3. 19	0. 76	0. 055	0. 51	0. 17	0. 59
1177	2. 74	. 37	. 61	. 037	0. 88	. 087	2. 97	1. 39	. 005	1. 49
1178	3. 11	. 86	. 115	. 026	1. 91	. 16	2. 25	0. 89	. 017	0. 94
1179	3. 35	. 64	. 23	. 165	1. 34	. 41	1. 31	. 23	. 036	. 31
1180	3. 28	1. 12	. 055	. 086	3. 04	. 20	0. 044	. 14	. 26	. 155
1181	3. 63	1. 32	. 29	. 052	2. 54	1. 47	. 11	2. 04	. 11	. 042
1182	1. 97	0. 45	. 85	. 046	0. 31	0. 49	. 22	. 029	. 060	. 018
1183	3. 05	. 91	. 011	. 025	1. 76	1. 01	. 53	. 077	. 080	. 029

[a] Size: Solid sections, approximately 1¼ in. square and ¾ in. thick. Suitable for optical and X-ray analysis.

[b] Standard 1180 contains some free graphite (approximately 0.1%); the other standards contain less than 0.01 percent.

[c] The elements Al, As, B, Bi, Co, Pb, Sb, Sn, Te, Ti, and Zr are present in useful concentration ranges. Some of these may be certified at a later date.

COPPER-BASE ALLOYS (SPECTROSCOPIC STANDARDS)

Sample Nos. [a]		Kind	Cu	Zn	Pb	Fe	Sn	Ni	Al	Mn
1106	C1106	Naval Brass A	59. 1	40. 0	0. 034	([b])	0. 74	[c] (0. 025)	------	0. 005
1107	C1107	Naval Brass B	61. 2	37. 3	. 19	------	1. 05	(. 095)	------	------
1108	C1108	Naval Brass C	64. 9	34. 4	. 06	------	0. 39	. 032	------	. 025

[a] Size and metallurgical condition: 1100 series are wrought samples 1¼ in. in diameter, ¾ in. thick. C1100 series are chill-cast samples 1¼ in. square, ¾ in. thick.

[b] Dashes indicate elements present but not certified.

[c] Values in parentheses are not certified, but are given for information on the composition.

TIN METAL (SPECTROSCOPIC STANDARDS)

Sample Nos. [a]		Cu	Pb	As	Sb	Ni	Zn	Ag	Bi	Cd	Co
431	831	0. 19	0. 19	0. 16	0. 19	0. 038	0. 041	0. 015	0. 020	0. 020	0. 021
432	832	. 097	. 094	. 075	. 095	. 020	. 020	. 0095	. 0098	. 0095	. 011
433	833	. 055	. 055	. 047	. 050	. 0095	. 0095	. 0055	. 0052	. 0053	. 0045
434	834	. 019	. 022	. 019	. 019	. 0044	. 0046	. 0018	. 0020	. 0020	. 0020
435	835	. 0077	. 015	. 0090	. 010	. 0024	. 0020	. 0010	. 0011	. 0011	. 0011

[a] Sizes: 400 series, rods ¼ in. in diameter, 4 in. long; 800 series, rods ½ in. in diameter, 2 in. long.

4. Summary of Analyses—Continued

4.1. Averaged Analyses—Continued

ZINC-BASE, DIE-CASTING ALLOYS (SPECTROSCOPIC STANDARDS)

Sample No.[a]	Kind[b]	Cu	Al	Mg	Fe	Pb	Cd	Sn	Cr	Mn	Ni	Si
625	Zinc-base A	0. 035	3. 06	0. 070	0. 035	0. 0014	0. 0006	0. 0005	0. 013	0. 031	0. 019	0. 018
626	Zinc-base B	. 055	3. 57	. 020	. 105	. 0021	. 0014	. 0011	. 039	. 048	. 048	. 042
627	Zinc-base C	. 135	3. 89	. 030	. 023	. 0082	. 0049	. 0042	. 004	. 014	. 003	. 024
628	Zinc-base D	. 61	4. 61	. 009	. 066	. 0044	. 0041	. 0017	. 009	. 009	. 030	. 009
629	Zinc-base E	1. 50	5. 16	. 094	. 016	. 013	. 015	. 012	. 0008	. 002	. 008	. 078
630	Zinc-base F	0. 98	4. 30	. 030	. 022	. 0083	. 0048	. 0040	. 003	. 011	. 003	. 023

[a] Size: Bar segments, 1¼ in. square and ¾ in. thick.
[b] NBS Nos. 625, 626, and 627 correspond to ASTM Alloy AG40A; NBS Nos. 628, 629, and 630 correspond to ASTM Alloy AC41A.

ZINC SPELTER (SPECTROSCOPIC STANDARD)

Sample No.[a]	Kind	Al	Fe	In	Cu	Cd	Mn	Cr	Sn
631	Zinc Spelter (modified)[b]	0. 50	0. 005	0. 0023	0. 0013	0. 0002	0. 00015	0. 0001	0. 0001
		Ga	Si	Pb	Mg	Ca	Ni	Ag	Ge
		[c](0. 002)	(<0. 002)	(0. 001)	(<0. 001)	(<0. 001)	(<0. 0005)	(<0. 0005)	(0. 0002)

[a] Size: Bar segments, 1¼ in. square and ¾ in. thick.
[b] Modified by addition of 0.5% Al.
[c] Values in parentheses are not certified, but are given for additional information on the composition.

NICKEL OXIDES (SPECTROSCOPIC STANDARDS)

Sample No.[a]	Kind	Co	Cu	Fe	Mg	Mn	Si	Ti	Al	Cr
671	Nickel oxide 1	0. 31	0. 20	0. 39	0. 030	0. 13	0. 047	0. 024	0. 009	0. 025
672	Nickel oxide 2	. 55	. 018	. 079	. 020	. 095	. 11	. 009	. 004	. 003
673	Nickel oxide 3	. 016	. 002	. 029	. 003	. 0037	. 006	. 003	. 001	. 0003

[a] Each sample consists of 25 g of powder.

4. Summary of Analyses—Continued

4.1. Averaged Analyses—Continued

HIGH-TEMPERATURE ALLOYS (SPECTROSCOPIC STANDARDS)

Sample No.[a]	Kind[b]	C	Mn	Si	Cr	Ni	Co	Mo	W
1184	19-9 DL	0.25	1.04	0.70	19.44	9.47	----	1.46	1.39
1185	AMS 5360A, AISI 316	.11	1.22	.40	17.09	13.18	----	2.01	----
1186	16-25-6 (Cr-Ni-Mo)	.074	0.72	.85	16.60	24.50	[c] (0.05)	5.92	(<0.01)
1187	AMS 5376A, Multimet (N-155)	.040	1.28	.94	21.62	20.26	20.80	3.41	2.40
1188	Inconel "X" 550	.035	----	.66	15.40	72.65	----	(0.3)	(0.02)
1189	Nimonic 80a	.041	0.81	.92	20.30	72.60	0.06	----	----
1191	Waspaloy	.020	.02	.26	19.48	55.15	13.65	4.62	(0.05)
1192	Waspaloy, Modified	.018	.17	.47	17.88	57.25	11.40	7.33	(<.01)

Sample No.[a]	Kind[b]	Nb	Ti	Al	Fe	P	S	Cu	Ta
1184	19-9 DL	0.49	0.056	----	----	0.015	0.012	----	0.022
1185	AMS 5360A, AISI 316	<.001	<.001	----	----	.019	.016	0.067	<.001
1186	16-25-6 (Cr-Ni-Mo)	----	----	----	50.7	----	----	----	----
1187	AMS 5376A, Multimet (N-155)	1.28	<.001	----	27.4	.011	----	----	.04
1188	Inconel "X" 550	1.11	2.14	0.76	6.60	----	----	----	(.11)
1189	Nimonic 80a	----	2.52	1.21	1.40	----	----	----	----
1191	Waspaloy	(<0.01)	3.10	1.55	2.04	----	----	.033	(<.01)
1192	Waspaloy, Modified	(<.01)	2.72	1.07	1.58	----	----	.056	(<.01)

Sample No.[a]	Kind[b]	B	Zr
1184	19-9 DL	----	----
1185	AMS 5360A, AISI 316	----	----
1186	16-25-6 (Cr-Ni-Mo)	----	----
1187	AMS 5376A, Multimet (N-155)	----	----
1188	Inconel "X" 550	----	(0.03)
1189	Nimonic 80a	----	----
1191	Waspaloy	0.0040	.050
1192	Waspaloy, Modified	.0015	.027

[a] Size: Disks 1¼ in. in diameter, ¾ in. thick.
[b] For optical emission and X-ray analysis.
[c] Values in parentheses are *not* certified, but are given for additional information on the composition.

TITANIUM-BASE ALLOYS (SPECTROSCOPIC STANDARDS)

Sample No.[a]	Kind	Mn	Cr	Fe	Mo	Al	V
641	8Mn (A)	6.68	----	----	----	----	----
642	8Mn (B)	9.08	----	----	----	----	----
643	8Mn (C)	11.68	----	----	----	----	----
644	2Cr-2Fe-2Mo (A)	----	1.03	1.36	3.61	----	----
645	2Cr-2Fe-2Mo (B)	----	1.96	2.07	2.38	----	----
646	2Cr-2Fe-2Mo (C)	----	3.43	2.14	1.11	----	----
653	6Al-4V (A)	----	----	----	----	7.25	2.58
654	6Al-4V (B)	----	----	----	----	6.03	3.83
655	6Al-4V (C)	----	----	----	----	4.63	5.38

[a] Size: Disks 1¼ in. in diameter, ¾ in. thick.

4. Summary of Analyses—Continued

4.1. Averaged Analyses—Continued

HYDROCARBON BLENDS [a]

Sample No.	592	593	594	595	596	597	598	599
Blend No.	1	2	3	4	5	6	7	8
n-Heptane	45	17						
2-Methylhexane	23	25						
3-Methylhexane	16	30						
2,2-Dimethylpentane	4							
2,3-Dimethylpentane	6	20						
2,4-Dimethylpentane	5	8						
3,3-Dimethylpentane	1							
n-Octane			39	12				
2-Methylheptane			19	25				
3-Methylheptane			16	23				
4-Methylheptane			8	8				
3-Ethylhexane			3	3				
2,3-Dimethylhexane			4	9				
2,4-Dimethylhexane			5	5				
2,5-Dimethylhexane			6	9				
3,4-Dimethylhexane				6				
Methylcyclohexane					57	32		
Ethylcyclopentane					9	14		
1,1-Dimethylcyclopentane					4	3		
1,*trans*-2-Dimethylcyclopentane					14	30		
1,*trans*-3-Dimethylcyclopentane					16	21		
Ethylcyclohexane							20	17
1,*trans*-2-Dimethylcyclohexane							18	7
1,*cis*-3-Dimethylcyclohexane							25	19
1,*trans*-4-Dimethylcyclohexane							11	14
1-Methyl-*cis*-2-ethylcyclopentane							7	20
1,1,3-Trimethylcyclopentane							5	4
1,*trans*-2-*cis*-3-Trimethylcyclopentane							9	6
1,*trans*-2-*cis*-4-Trimethylcyclopentane							5	13

[a] For the individual components present in the mixtures in the amount of 10 percent or less, the limits of error in composition are not greater than ±0.01 percent and for components present in over 10 percent, the limits of error are not greater than ±0.10 percent. The composition of each blend is given in volume. A certificate is supplied with each of these samples.

ORES

Sample No.	Kind	Elements certified
27d	Iron, Mesabi	SiO_2, 2.10; P, 0.028; Fe, 64.96
28a	Iron, Norrie	Mn, 0.435
181	Lithium (Spodumene)	Li_2O, 6.4
182	Lithium (Petalite)	Li_2O, 4.3
183	Lithium (Lepidolite)	Li_2O, 4.1
25c	Manganese	Mn, 57.85; Available O_2, 16.70
137	Tin (Bolivian concentrate)	Sn, 56.6
138	Tin (N.E.I. concentrate)	Sn, 74.8
113	Zinc (Tri-State concentrate)	Zn, 61.1

PHOSPHATE ROCK

Sample No.	Kind	P_2O_5	Fe_2O_3	Al_2O_3	CaO	MgO	F	MnO	Na_2O	K_2O	TiO_2	CO_2
120a	Florida	34. 4	1. 00	0. 94	50. 3	0. 26	3. 92	0. 02	0. 41	0. 10	0. 12	3. 18

4. Summary of Analyses—Continued

4.1. Averaged Analyses—Continued

CHROME, ALUMINA, AND SILICA REFRACTORIES, BAUXITE

Sample No.	Kind	SiO_2	Al_2O_3	Fe_2O_3	FeO	TiO_2	ZrO_2	MnO	P_2O_5	V_2O_5
76	Alumina refractory	54. 7	37. 7	2. 4		2. 2	0. 07		0. 07	0. 02
77	Alumina refractory	32. 4	59. 4	0. 90		2. 9	. 09		. 45	. 03
78	Alumina refractory	20. 7	70. 0	. 79		3. 4	. 12		. 62	. 05
103a	Chrome refractory	4. 6	29. 95		12. 4	0. 22		0. 11	. 01	
198	Silica refractory		0. 16	. 66		. 02	<. 01	<. 01	. 02	
199	Silica refractory		. 48	. 74		. 06	. 01	<. 01	. 01	
69a	Bauxite	6. 0	55. 0	5. 8		2. 8	. 18	<. 01	. 08	. 03

Sample No.	Kind	Cr_2O_3	CaO	BaO	MgO	Li_2O	Na_2O	K_2O	SO_3	Loss on ignition
76	Alumina refractory		0. 27		0. 58	0. 11	0. 15	1. 54		0. 22
77	Alumina refractory		. 26		. 50	. 35	. 06	2. 11		. 21
78	Alumina refractory		. 38		. 51	. 20	. 06	2. 83		. 26
103a	Chrome refractory	32. 05	. 70		18. 50					
198	Silica refractory		2. 71		0. 07	. 001	. 01	0. 02		. 21
199	Silica refractory		2. 41		. 13	. 002	. 01	. 09		. 17
69a	Bauxite	0. 05	0. 29	0. 01	. 02		<. 01	<. 01	0. 04	29. 55

FELDSPAR

Sample No.	Kind	K_2O	Na_2O	SiO_2	Al_2O_3	Fe_2O_3	CaO	MgO	TiO_2	Loss on ignition
99	Soda	0. 41	10. 73	68. 66	19. 06	0. 067	0. 36	0. 053	0. 017	0. 52

GLASS SAND

Sample No.		Fe_2O_3
165		0. 019

GLASSES

Sample No.	Kind	SiO_2	PbO	Al_2O_3	Fe_2O_3	ZnO	MnO	TiO_2	ZrO_2	CaO	BaO
89	Lead-barium	65. 35	17. 50	0. 18	0. 049		0. 088	0. 01	0. 005	0. 21	1. 40
91	Opal	67. 53	0. 097	6. 01	. 081	0. 08	. 008	. 019	. 01	10. 48	
92	Low-boron										
93	High-boron	80. 60		1. 94	. 076			. 027	. 013	([a])	

Sample No.	Kind	MgO	K_2O	Na_2O	B_2O_3	P_2O_5	As_2O_5	As_2O_3	SO_3	Cl	F	Loss on ignition
89	Lead-barium	0. 03	8. 40	5. 70		0. 23	0. 36	0. 03	0. 03	0. 05		0. 32
91	Opal	. 008	3. 25	8. 48		. 022	. 102	. 091		. 014	5. 72	
92	Low-boron				0. 70							
93	High-boron	. 026	0. 16	4. 16	12. 76	([a])	. 14	. 085	. 009	. 036		

[a] Not detected.

4. Summary of Analyses—Continued

4.1. Averaged Analyses—Continued

LIMESTONE, PORTLAND CEMENT, SILICA BRICK, BURNED MAGNESITE, AND TITANIUM DIOXIDE

Sample No.	Kind	SiO_2	Fe_2O_3	Al_2O_3	TiO_2	MnO	CaO	SrO	MgO	Na_2O
1a	Limestone	14. 11	1. 63	4. 16	0. 16	0. 038	41. 32	0. 23	2. 19	0. 39
177	Portland cement	21. 92	2. 39	5. 27	. 26	--------	64. 32	. 05	2. 45	. 14
102	Silica brick [a]	93. 94	0. 66	1. 96	. 16	. 005	2. 29	--------	0. 21	. 015
104	Burned magnesite	2. 54	7. 07	0. 84	. 03	. 43	3. 35	--------	85. 67	. 015
154a	Titanium dioxide	--------	--------	--------	99. 6	--------	--------	--------	--------	--------

Sample No.	Kind	K_2O	SO_3	S	P_2O_5	CO_2	C	Mn_3O_4	Loss on ignition
1a	Limestone	0. 71	0. 04	0. 25	0. 15	33. 53	0. 61	--------	34. 55
177	Portland cement	. 57	1. 59	--------	. 04	--------	--------	0. 05	1. 15
102	Silica brick	. 32	--------	--------	. 025	--------	--------	--------	0. 38
104	Burned magnesite	. 015	--------	--------	. 057	--------	--------	--------	--------

[a] Density 2.33 g/cm³ at 25 °C.

SILICON CARBIDE

Sample No.		Total Si	Total C	Free C	SiC	Fe	Al	Ti	Zr	Ca	Mg
112	--------	69. 11	29. 10	0. 09	96. 85	0. 45	0. 23	0. 025	0. 027	0. 03	0. 02

4.2. Chemicals

Sample No.	Name	Purity on basis of titration	Heat of combustion
84f	Acid potassium phthalate	99. 99	
39h	Benzoic acid	99. 98	26.434 absolute kilojoules per gram mass (wt in vacuum).
350	Benzoic acid	99. 98	
40g	Sodium oxalate	99. 95	
83b	Arsenic trioxide	100. 00	
136b	Potassium dichromate	99. 98	
950a	Uranium oxide U_3O_8	99. 94	

SUGARS

Sample No.	Kind	Moisture	Reducing substances	Ash
17	Sucrose	<0.003	<0.002	<0.003
41	Dextrose	$<.01$	--------	$<.003$

WASHINGTON, August 30, 1961.

UNITED STATES DEPARTMENT OF COMMERCE
WASHINGTON 25, D.C.

National Bureau of Standards
Certificate of Analyses

Standard Sample 673, Nickel Oxide, No. 3[a]

Percent of the element in nickel oxide [b]

Laboratory	Co	Cu	Fe	Mg	Mn	Si	Ti	Al	Cr
Chemical:									
1	0.016					0.0076			
2		0.0024	0.023		0.0041	.0033	0.0032	0.0013	0.0003
3	.019	.001	.028	0.0042	.0027		.0026	.0009	.0014
4	.020			.0018		.0066		<.001	<.001
5	.014	.0024	.032	.0035	.0036	.0035	.0028	.0010	.0003
Spectrochemical:									
6	0.015	0.0024	0.031	0.0029	0.0041	0.0074	0.0030	0.0013	0.0004
7		.0018	.028	.0020	.0037	.0047	.0035	.0009	.0002
8	.015	.0016	.029	.004	.0039		.0025	.0012	<.001
9	.016	.0024	.031	.0028	.0034	.0055	.0040		.0004
10	.013	.0012	.029	.0025	.0042	.0057	.0032	.0014	.0011
11	.014	.0023	.029	.0023	.0039	.0081	.0026	.0007	.0007
12	.019	.0012	.023	.0021	.0040	.0066	.0036		≤.001
13	.015	.0017	.028	.0026	.0032		.0033		≤.0004
Recommended value	**0.016**	**0.002**	**0.029**	**0.003**	**0.0037**	**0.006**	**0.003**	**0.001**	**0.0003**

[a] *Intended use.*—While this standard is suitable for general use, it was prepared primarily for application in the spectrographic analysis of nickel by Tentative Method E 129–57T (Methods for Emission Spectrochemical Analysis, ASTM, 1957). When the standard is applied in this method, it is recommended that 0.3 g or more of the standard be dissolved and converted to oxide by the same procedure used for the sample to be analyzed, and preferably at the same time.

[b] *Nickel content.*—The approximate nickel content of Standard 673 is 77.7 percent. To convert the concentration values in the table from the basis of percent element in nickel oxide to the basis of percent element in total metal present, multiply the values by 1.29.

List of Cooperating Laboratories

Chemical:
1. National Bureau of Standards, Washington, D.C.
2. W. B. Coleman and Co., Philadelphia, Pa.
3. Sperry Gyroscope Co., Great Neck, N.Y.
4. Superior Tube Co., Norristown, Pa.
5. Sylvania Electric Products Inc., Towanda, Pa.

Spectrochemical:

6. National Bureau of Standards, Washington, D.C.
7. Bell Telephone Laboratories, Murray Hill, N.J.
8. W. B. Coleman and Co., Philadelphia, Pa.
9. The International Nickel Co., Huntington Works, Huntington, W. Va.
10. The International Nickel Co., Research Lab., Bayonne, N.J.
11. The Mond Nickel Co. Ltd., Birmingham, England.
12. National Research Corp., Cambridge, Mass.
13. Raytheon Manufacturing Co., Newton, Mass.

The nickel oxide was prepared from the metal by the J. T. Baker Chemical Co., Phillipsburg, N.J.

WASHINGTON 25, D.C., September 12, 1960. A. V. ASTIN, *Director.*

FIGURE 2. *Certificate of analysis for standard sample 673, nickel oxide, No. 3.*

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U.S. DEPARTMENT OF COMMERCE
Luther H. Hodges, *Secretary*

NATIONAL BUREAU OF STANDARDS
A. V. Astin, *Director*

THE NATIONAL BUREAU OF STANDARDS

The scope of activities of the National Bureau of Standards at its major laboratories in Washington, D.C., and Boulder, Colorado, is suggested in the following listing of the divisions and sections engaged in technical work. In general, each section carries out specialized research, development, and engineering in the field indicated by its title. A brief description of the activities, and of the resultant publications, appears on the inside of the front cover.

WASHINGTON, D.C.

Electricity. Resistance and Reactance. Electrochemistry. Electrical Instruments. Magnetic Measurements. Dielectrics. High Voltage.
Metrology. Photometry and Colorimetry. Refractometry. Photographic Research. Length. Engineering Metrology. Mass and Scale. Volumetry and Densimetry.
Heat. Temperature Physics. Heat Measurements. Cryogenic Physics. Equation of State. Statistical Physics.
Radiation Physics. X-ray. Radioactivity. Radiation Theory. High Energy Radiation. Radiological Equipment. Nucleonic Instrumentation. Neutron Physics.
Analytical and Inorganic Chemistry. Pure Substances. Spectrochemistry. Solution Chemistry. Standard Reference Materials. Applied Analytical Research.
Mechanics. Sound. Pressure and Vacuum. Fluid Mechanics. Engineering Mechanics. Rheology. Combustion Controls.
Organic and Fibrous Materials. Rubber. Textiles. Paper. Leather. Testing and Specifications. Polymer Structure. Plastics. Dental Research.
Metallurgy. Engineering Metallurgy. Microscopy and Diffraction. Metal Reactions. Corrosion. Metal Physics. Electrolysis and Metal Deposition.
Mineral Products. Engineering Ceramics. Glass. Refractories. Enameled Metals. Crystal Growth. Physical Properties. Constitution and Microstructure.
Building Research. Structural Engineering. Fire Research. Mechanical Systems. Organic Building Materials. Codes and Safety Standards. Heat Transfer. Inorganic Building Materials.
Applied Mathematics. Numerical Analysis. Computation. Statistical Engineering. Mathematical Physics. Operations Research.
Data Processing Systems. Components and Techniques. Digital Circuitry. Digital Systems. Analog Systems. Applications Engineering.
Atomic Physics. Spectroscopy. Infrared Spectroscopy. Solid State Physics. Electron Physics. Atomic Physics.
Instrumentation. Engineering Electronics. Electron Devices. Electronic Instrumentation. Mechanical Instruments. Basic Instrumentation.
Physical Chemistry. Thermochemistry. Surface Chemistry. Organic Chemistry. Molecular Spectroscopy. Molecular Kinetics. Mass Spectrometry.
Office of Weights and Measures.

BOULDER, COLO.

Cryogenic Engineering. Cryogenic Equipment. Cryogenic Processes. Properties of Materials Cryogenic Technical Services.
Ionosphere Research and Propagation. Low Frequency and Very Low Frequency Research. Ionosphere Research. Prediction Services. Sun-Earth Relationships. Field Engineering. Radio Warning Services.
Radio Propagation Engineering. Data Reduction Instrumentation. Radio Noise. Tropospheric Measurements. Tropospheric Analysis. Propagation-Terrain Effects. Radio-Meteorology. Lower Atmosphere Physics.
Radio Standards. High Frequency Electrical Standards. Radio Broadcast Service. Radio and Microwave Materials. Atomic Frequency and Time Interval Standards. Electronic Calibration Center. Millimeter-Wave Research. Microwave Circuit Standards.
Radio Systems. High Frequency and Very High Frequency Research. Modulation Research. Antenna Research. Navigation Systems.
Upper Atmosphere and Space Physics. Upper Atmosphere and Plasma Physics. Ionosphere and Exosphere Scatter. Airglow and Aurora. Ionospheric Radio Astronomy.